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Avoiding Obvious Artificiality—*Hardy*

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THE STATUS OF THUMB-SUCKING AND FINGER-SUCKING

By LELAND R. JOHNSON, D.D.S., M.S.D., F.A.C.D., Chicago, Ill.

A REVIEW of the dental literature on the subject of thumb-sucking reveals that, although the habit was mentioned as early as 1841, by William Imrie, it was not considered as an etiologic factor of malocclusion until Chandler, in 1878, said, "There is no one cause so productive of malformation of the bones of the mouth and irregularity of the teeth as the habit of thumb-sucking in infancy, the different positions of the thumb giving rise to different kinds of deformity."

Progress which led to our present ideas on the correction of habits in general dates back to 1915, when A. LeRoy Johnson introduced the psychologic and biologic consideration of habits from the viewpoints of their origin and operation.

The literature contains but few articles on thumb-sucking as related to malocclusion which are backed by scientific investigation. Most articles are of the nature of case reports, describing the single method used to correct the habit of thumb-sucking or finger-sucking in an individual case. There are, however, several investigations worthy of praise.

Milo Hellman, in 1921, in a study of the etiology of Angle's Class II malocclusion, was the first to attempt to determine the percentage of cases of Class II malocclusion in which the sucking habit, in one form or another, was an etiologic factor. Since Hellman considered all sucking habits together, it is impossible to compare his findings with those confined to thumb-sucking and finger-sucking.

Samuel J. Lewis, in 1930, reported a study of 170 children to determine the number in that group who had malocclusion in the deciduous dentition directly associated with thumb-sucking or finger-sucking. His conclusions were somewhat positive considering his evidence, but, on the whole, his was a creditable study. In 1931, he published the same study with an added group of 131 cases. His conclusions were somewhat modified in

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this study and are more consistent with the evidence.

The other investigator who deserves mention is E. W. Swinehart, who, in 1938, published two articles reporting a study of thirty-eight thumb-sucking and finger-sucking children. In this study, he determined the percentages of the different types of malocclusion associated with the habit. The most impressive part of this study was his analysis of the different forces exerted during thumb-sucking and finger-sucking. He says,

> There are three main abnormal forces exerted in thumb-sucking: (a) the passive force of the digit held between the arches; (b) abnormal contraction of the cheeks against the sides of the arches, and (c) abnormal muscular pressure of the digit against the palate. These forces begin in the plastic age of infancy and are often continued through the formative period of childhood.

TABLE 1.—GENERAL SURVEY TO SHOW THE PERCENTAGE OF THUMB-OR-FINGER-SUCKERS IN CHILDREN WITH MALOCCLUSION

Number of Cases Studied	Thumb-Suckers and Finger-Suckers	Percentage of Thumb-Suckers and Finger-Suckers
989	173	17.49

All of the men mentioned seem to agree that the habit of thumb-sucking or finger-sucking can be a definite etiologic factor in malocclusion. There is, however, a lack of agreement as to the average number of cases of Class II (Angle) malocclusion in the different groups studied. There is also a large variation in the data presented by the different investigators relative to the average number of thumb-suckers and finger-suckers in the different groups studied. It is probable that this variation is due to the small number in each group studied. With this in mind, it seemed that more accurate data could be obtained by the study of a large group of children.

A group of 989 children composed of 371 children from private practice and 618 from the Department of Orthodontics of Northwestern University Dental School was used in this study. The ages of these children were from 2 years and 6 months to 19 years. There were only eight of this number above the age of 14 years. By combining private practice and clinic patients, it was thought that a better cross-section of children in general would be available.

Attention was first given to the incidence of thumb-sucking and finger-sucking among children with malocclusion. Table I shows that in 989 cases of malocclusion, 173, or 17.49 per cent, had sucked the thumb or the fingers.

TABLE 2.—GENERAL TYPES OF MALOCCLUSION FOUND IN GROUP OF ONE HUNDRED FIFTY-THREE THUMB-SUCKERS AND FINGER-SUCKERS

Thumb-Suckers and Finger-Suckers	Malocclusion		
	Class I (Angle)	Class II (Angle)	Class III (Angle)
153	78	73	2
Percentage	50.98	47.7	1.3

It cannot be stated that in those cases of sucking the thumb or finger, the thumb-or-finger-sucking habit was the only etiologic factor involved. It can be stated, however, that of 989 cases of malocclusion, in 173 there was sucking of the thumb or fingers, and, with the exception of three cases, that the thumb-sucking or finger-sucking habit may have been an etiologic factor in the existing malocclusion. The three cases excepted showed no ill-effect of the habit, the thumb-sucking having been only occasional.

As it was impossible to obtain from some of the records definite data regarding the classification of the malocclusion, only 153 of the thumb-suckers and finger-suckers could be used to determine the percentages of the different classes of malocclusion. Table 2 shows the general types of malocclusion found in the 153 children who had sucked the thumb or finger.

Table 3.—Length of Time Habit of Thumb-Sucking or Finger-Sucking Persisted

Cases No.	Percentage	Time
2	2.85	Occasionally
17	24.28	1 year or less
11	15.71	2 years
12	17.18	3 years
3	4.28	4 years
5	7.14	5 years
8	11.42	6 years
2	2.85	7 years
3	4.28	8 years
7	10.00	10 years or longer

Of the 153 thumb-suckers, seventy-eight, or 50.98 per cent, had Class I (Angle) malocclusion; seventy-three, or 47.7 per cent, Class II, and two, or 1.3 per cent, Class III. No attempt was made to divide the cases of Class II malocclusion into divisions or subdivisions.

The question next to arise is: How long did these children suck the thumb or the finger? In the group of 173 thumb-suckers and finger-suckers, there were seventy cases the records of which showed when the habit was broken or, if not broken, how long it had persisted. (Table 3.)

Three interesting facts, revealed in Table 3, should be noted: (1) 24.28 per cent, practically one-fourth, sucked the thumb or finger for one year or less; (2) 60 per cent had broken the habit by the end of the third year, and (3) 10 per cent had indulged in the habit for ten years or longer. It is surprising that one of every ten thumb-suckers continued the habit after 10 years of age. As to the 90 per cent, the question naturally arises: In how many of these cases of malocclusion was the thumb-sucking definitely an etiologic factor? That question cannot be answered because these children had not been observed before they appeared for examination. In the number who sucked the thumb

Table 4.—Comparison of Findings of Five Investigations

Investigator	Cases Studied	Number Who Sucked Thumb or Fingers	Thumb-Suckers and Finger-Suckers Per Cent	Malocclusion Per Cent	
				Class II	Other Classes
Hellman	354	90*	29.03*	62.22	37.77
Lewis	170	41	24.1		
Lewis	131	36	27.48		
Swinehart	?	38	?	42	57.8
Johnson	989	173	17.49		
Johnson		153†		47.7	52.3

*Includes lip-suckers and tongue-suckers as well as thumb-suckers and finger-suckers.
†Compare Table 2.

one year or less, the malocclusion may have corrected itself and there may have been in the malocclusion other etiologic factors that needed treatment. On the other hand, the original malocclusion caused by thumb-sucking may have led to other habits that increased or modified the original malocclusion.

Table 4 represents an attempt to compare the findings of five investigations.

It is difficult to compare findings where variations in methods of investigation occur. However, in Table 4, the percentage of thumb-suckers and finger-suckers in different groups of children, and the percentage of types of malocclusion associated with thumb-sucking and finger-sucking may be compared. For comparison, the types of malocclusion are divided into Class II (Angle) malocclusion and other classes. Hellman found ninety cases, or 29.03 per cent, with sucking habits in a group of 354 children. This study was chiefly concerned with the etiology of Class II malocclusion, and his method of attack made a grouping of cases of sucking of the lip, tongue, thumb and finger. The fact that all sucking habits were included probably accounts for the high percentage of 29.03.

In his study of 170 children, Lewis found thirty-two thumb-suckers and nine finger-suckers, a total of forty-one, or 24.1 per cent. In his group of 131 children, there were twenty-seven thumb-suckers and nine finger-suckers, a total of thirty-six, or 27.48 per cent.

It would seem that a difference of 3.38 per cent between the thumb-or-finger-suckers of the two groups is too great. In the study of 989 cases, there were 173, or 17.49 per cent, thumb-suckers and finger-suckers. There is a variation of 6.61 per cent between this group and Lewis' group of 170, and a difference of 9.99 per cent between this group and Lewis' group of 131. This difference can be accounted for by the fact that the larger the group studied, the more accurate the findings become. It is interesting to note that in the first fifty-five cases studied in the group of 989, there were twenty-two thumb-suckers. This percentage of 40, as compared to the final figure of 17.49, serves as an admirable example of the unreliability of conclusions drawn from small numbers of cases.

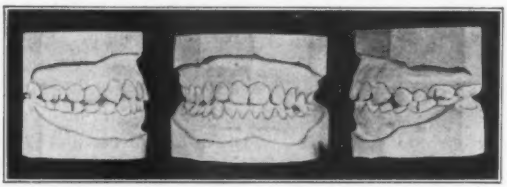

Fig. 1.—Class III malocclusion with history of thumb-sucking for three years. The habit may have prevented the lingual locking of the maxillary incisors.

It is impossible to compare the incidence of thumb-sucking and finger-sucking with the findings of Swinehart because he does not give the total number of cases from which his group of thirty-eight thumb-suckers and finger-suckers were selected. However, it is possible to compare the types of malocclusion among the thumb-suckers and finger-suckers of two of the groups. It may be noted that Swinehart found that 42 per cent of the thumb-suckers and finger-suckers had Class II malocclusion and 57.8 per cent had other types, as compared to my findings of 47.7 per cent Class II and 52.3 per cent of other types. Again, a number as small as thirty-eight

cases might not be accurate. There is a difference in the findings of the two investigations of approximately 5.5 per cent.

It has been established, and is generally accepted, that thumb-sucking or finger-sucking may be an etiologic factor in malocclusion. The malocclusion may be of any type and the thumb-or-finger-sucking habit may be entirely or only partially responsible. There were two Class III (Angle) cases in the 153 cases studied. However, it is doubtful that the thumb-sucking habit was an etiologic factor in the mesial relation of the mandible to the maxillae in this instance. (Fig. 1.) In all probability, the habit prevented the maxillary incisors from becoming locked lingually to the mandibular incisors. This is the exception in which correction of the thumb-sucking habit is contraindicated. The thumb was sucked in this case only until the boy was 3 years of age.

Figure 2 shows the occlusion of a girl 9 years and 8 months of age who sucked the thumb until 5 years of age. This is the typical Class II (Angle) malocclusion in which thumb-sucking has been an etiologic factor. No doubt there are other factors since this child also held the mouth open.

In many instances, some other habit is associated with the thumb-sucking habit or develops after the habit is broken. In making a diagnosis, care must be used to determine the etiologic factor. Figure 3 shows a case of malocclusion in which an open bite is associated with a distal relation of the mandible to the maxillae. The history of this case reveals that the child sucked the thumb in infancy, but from the time the habit had been broken, the tongue had been held between the teeth. The thumb-sucking habit in this instance was only a contributing factor, leading to the tongue habit which really caused the open bite. The distal relation of the mandible to the maxillae may have been due to other conditions.

Often the thumb-sucking habit is of a definite type in Class II (Angle) malocclusion. The thumb is so held that there is a prying action. The back of the thumb rests on the incisal edges of the mandibular incisors and the front of the thumb rests against the lingual surfaces of the maxillary incisors and upon the surface of the palate. The weight of the hand becomes the force applied to this lever, and the incisal edges of the mandibular incisors, the fulcrum, and a forward force is applied to the maxillary incisors and alveolar process. This prying also exerts a backward force on the mandible which produces a favorable condition for the locking of the mandible in a position distally to its normal relation with the maxillae. In this type of thumb-sucking, the alveolar process and palate are carried forward. (Fig. 4.)

A second type of thumb-sucking is that in which the hand is held high and is not permitted to drop. Pressure is exerted upward and outward on the maxillary incisors. This type is often present in Class I (Angle) malocclusion. In this instance, the maxillary incisors are simply

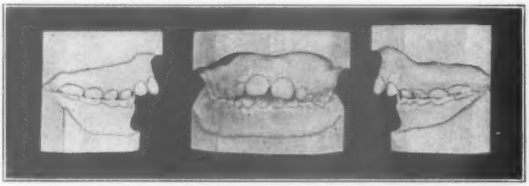

Fig. 2.—Typical Class II (Angle) malocclusion in which thumb-sucking was an etiologic factor.

tipped labially. The malocclusion caused by this type is similar to that caused by finger-sucking. Figure 5 shows the malocclusion resulting from this type of thumb-sucking.

It has been established by Lewis that thumb-sucking may be a definite etiologic factor in malocclusion in the deciduous denture. Figure 6 shows a deciduous denture in which malocclusion was caused by thumb-sucking.

Lewis, in an article published in 1931, concludes that "There is a general tendency for malformations resulting from thumb-sucking to correct themselves if the habit is broken by the time the child is five years of age; but the malformations do not, as a rule, correct themselves if the habit persists." Unfortunately, this conclusion has resulted in much harm because it has been accepted by many men as true in all cases in which the habit was broken by the age of 5 years. The conclusion was based upon observation of twenty-four cases of malocclusion in the deciduous denture in which the etiologic factor was thumb-sucking. Of these twenty-four cases of malocclusion, nine corrected themselves after the habit was broken. This is only 37.5 per cent of the entire group, 62.5 per cent remaining which did not correct themselves.

That cases of malocclusion in the deciduous denture which have been caused by thumb-sucking will correct themselves is only an opinion based upon clinical observation and the provision that the lips function normally after the habit is broken. The normally functioning lips act as an appliance and move the teeth to their normal positions. If normal function of the lips does not exist, the malocclusion can be expected to continue and, in all probability, become progressively worse.

It has been pointed out that in approximately one of every six cases of malocclusion, the habit of thumb-sucking or finger-sucking has been a contributing etiologic factor. It has also been shown that one in every ten thumb-suckers and finger-suckers continues the habit after the age of 10 years. Table 3 shows that 71.44 per cent, or approximately seven of every ten thumb-suckers, had broken the habit by the age of 5 years. Assuming, then, that 62.5 per cent of these cases will not correct themselves after the habit is broken, it can be said that four and one-half of every seven cases will need orthodontic treatment. Under these circumstances, it would seem advisable to prevent the thumb-sucking habit in infancy. Prevention of this habit requires cooperation of the pediatrician and the parents, and the chief responsibility falls upon the pediatrician or the attending physician because the parents look to him for guidance. That being the case, attention is called to the attitude of the physician toward the habit of thumb-or-finger-sucking.

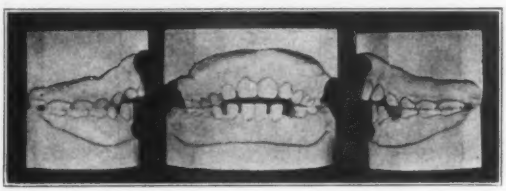

Fig. 3.—Case in which thumb-sucking was a contributing factor, but the tongue habit was responsible for the open bite.

Many (not all) physicians feel that thumb-sucking is a harmless habit. They feel that because most children (seven

out of ten) break the habit by 5 years of age, no harm will result. They feel that any sucking habit is merely a normal manifestation of sex and that an attempt to break the habit may do more harm than good to the child. The advice in many instances is, therefore, to let the child suck its thumb if it wants to. The physician is not to be criticized for this attitude and will no doubt alter his views when adequate evidence is presented. He has perhaps based his opinions upon writings by dentists and psychologists without too close analysis of their conclusions.

The views of many psychologists are

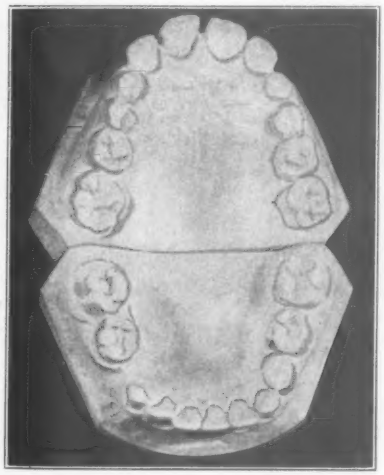

Fig. 4.—Thumb-sucking case in which alveolar process and palate are molded forward.

based upon the writings of Freud, who says,

> Thumb-sucking, which manifests itself in the nursing baby and which may be continued till maturity or throughout life, consists in a rhythmic repetition of sucking contact with the mouth (the lips), wherein the purpose of taking nourishment is excluded. A part of the lip itself, the tongue, which is another preferable skin region within reach, and even the big toe may be taken as objects for sucking. Simultaneously, there is also a desire to grasp things, which manifests itself in a rhythmical pulling of the earlobe and which may cause the child to grasp a part of another person (generally the ear) for the same purpose. The pleasure-sucking is connected with an entire exhaustion of attention and leads to sleep or even to a motor reaction in the form of an orgasm. Pleasure-sucking is often combined with the rubbing contact of certain sensitive parts of the body, such as the breast and the external genitals. It is by this road that many children go from thumb-sucking to masturbation.

Lindner himself has recognized the sexual nature of this action and openly emphasized it. In the nursery, thumb-sucking is often treated in the same way as any other sexual "naughtiness" of the child. A very strong objection was raised against this view by many pediatrists and neurologists, which in part is certainly due to the confusion of the terms "sexual" and "genital." This contradiction raises the difficult question, which cannot be rejected; namely, in what general traits do we wish to recognize the sexual manifestations of the child? I believe that the association of the manifestations into which we gained an insight through psycho-analytic investigation justifies us in claiming thumb-sucking as a sexual activity and in studying through it the essential features of the infantile sexual activity. . . . Let us insist that the most striking character of this sexual activity is that the impulse is not directed against other persons, but that it gratifies itself on its own body; to use the happy term invented by Havelock Ellis, we will say that it is autoerotic.

It is, moreover, clear that the action of the thumb-sucking child is determined by the fact that it seeks a pleasure which has already been experienced and is now remembered. Through the rhythmic sucking on a portion of the skin or mucous membrane, it finds gratification in the simplest way. It is also easy to conjecture on what occasions the child first experienced this pleasure which it now seeks to renew. The first and most important period in a child's life, the sucking from the mother's breast (or its substitute), must have acquainted it with this pleasure. We would say that the child's lips behaved like an erogenous zone, and that the excitement through the warm stream of milk was really the cause of the pleasurable sensation. To be sure, the gratification of

the erogenous zone was first united with the gratification of taking nourishment. . . . But the desire for repetition for the sexual gratification is separated from the desire for taking nourishment; a separation which becomes unavoidable with the appearance of the teeth when the nourishment is no longer sucked in, but chewed.

David M. Levy believes that the primary cause of finger-sucking is insufficient sucking at the breast or bottle. He determined that the percentage of finger-sucking problems is also consistent with the sucking time, rising as high as 40 per cent in infants fed at four-hour intervals to as low as 6 per cent in unscheduled feeders. Levy pretty well sums up the view of the psychologist when he says,

In general, psychiatric advice as to the finger-sucking habit has been to ignore it. Such advice has been given on the basis that the child evidently needs the sucking it derives in this manner and, if it does no harm, there is no reason to interfere with it. When there is no question that it is harmful, psychiatrists have generally been at a loss as to methods of dealing with it. The harm occurs in those cases in which the absorption in the act is sufficiently great to prevent normal interest in other activities, in some cases even to ordinary learning.

He recognizes the harmful effect of the habit on the occlusion and says,

In regard to advice as to the prevention of the act, psychiatrists seem to be puzzled like everyone else. Their hope is generally that the sucking habit will stop once the emotional difficulties of the child are solved, since, as is well known, a finger-sucking child will utilize the habit especially when it is in a state of emotional tension.

The problem of thumb-sucking, to the orthodontist, is serious. One cannot practice orthodontia very long and not be impressed by the many cases in which thumb-sucking has been a contributing if not the primary etiologic factor in malocclusion. The difficulty of control of the habit to assure one that the functioning occlusion, obtained by orthodontic treatment, will not relapse has made the orthodontist feel that it would have been much better for every one concerned had the habit been prevented in early infancy.

The attempts of the orthodontist to educate the laity to the harmful effects of thumb-sucking are constantly being hampered by syndicated articles appearing in the daily newspapers. Some of these articles go so far as to condone thumb-sucking and advise the parents to let the child suck its thumb because no harm will come from it. However, occasionally a sound article appears, and these no doubt are helpful.

Fig. 5.—Malocclusion of thumb-sucker in which the force of the thumb was directed upward and outward.

These conflicting opinions from the many sources of information simply serve to confuse the average mother. When her baby starts to suck its thumb, she may try one or two methods of breaking the habit and, if not successful, she may take refuge in the source of information which says the habit is harmless. In all probability, she will eventually learn that the information was incorrect, but that is very little consolation in the face of an extended period of orthodontic

treatment and the fact that the child's behavior is greatly modified because of the habit.

There may be confusion in the minds of some dentists regarding this problem. The best thought in the profession agrees that there is definite evidence that thumb-sucking or finger-sucking may be an etiologic factor in malocclusion in either the deciduous or the permanent dentition. The habit may be accompanied by other habits called accessory habits, which may either modify or accentuate the malocclusion. These habits are mouth-breathing, open-mouth, lip-biting, lip-sucking, tongue-sucking, cheek-sucking, tongue-thrusting, etc. In regard to the cause of these sucking habits, there may be some difference of opinion. They may be a manifestation of the sexual instinct of the child. This in itself is not serious unless the sucking habit becomes a pleasure-sucking habit and is repeated too often.

Buford J. Johnson says, "Thumb-sucking as a problem in the child of one to five years of age probably has its basis in the failure of the diffuse activities of the infant to become differentiated into specific behavior toward an end." She believes it important that periods of hunger not be prolonged, because of the close association of sucking to food getting. She believes also that prevention is important and suggests, because the ends of activity for the infant appear to be other activities, that opportunity for progressor movements and for manipulation be provided. The infant is less likely to suck the thumb if, for instance, he is placed in a pen or bed which is strong and he thinks refraining from the habit will help him in his efforts toward rolling, pushing, pulling and kicking. Even hunger may be utilized under these circumstances. If, however, a soft fluffy bed is used and the gross muscle activities are hampered by too much clothing or covering, compensation may be found in the habit of sucking the finger.

The correction of the habit is an individual problem, varying according to the individual. Motivation, by which is meant arousing the interest of the child to break a habit, is important. Threatening and nagging, because of the harmful formation of avoidance habits, should be avoided. At first, in thumb-sucking, the emotional elements appear to be minimal, but later the habit becomes a substitute activity under situations that arouse emotional excitement. When it has developed to this point, less attention should be paid to the act itself and more attention to the provision and stimulation of more desirable activities. This is the ideal method, but frequently it becomes necessary to resort to others.

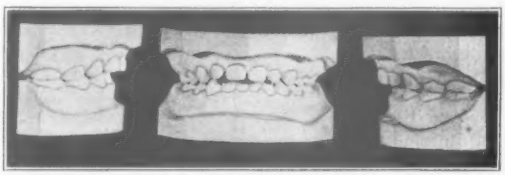

Fig. 6.—Deciduous dentition in which malocclusion was caused by thumb-sucking.

The many methods described in the literature include painting bitter tasting drugs on the finger or thumb and placing appliances such as cribs over the thumb or appliances on the arm to prevent bending the arm, and the use of mittens. As to the appliances Buford J. Johnson says,

> It is very doubtful if mechanical contrivances on fingers or splints to arms aid as much as they interfere in the elimination of thumb-sucking. They are likely to focus at-

tention upon the arm or hand which is already associated with the response, thereby serving as a stimulus. Restriction may accentuate the desire by continued stimulation of arm and finger and by interference with other activities that might supersede the sucking reaction.

An appliance which has proved itself to be very efficient is worn in the mouth. The maxillary first deciduous molars are banded and to the bands is soldered a wire which crosses the palate and stands far enough away from the palate to prevent any possibility of suction between thumb and palate. This appliance is cemented to the teeth. By destroying the suction, a pleasure-giving situation is converted into an unpleasant one and the habit is broken.

For the child of several years who sucks the thumb when going to sleep, a very efficient method consists in placing boxing gloves on the hands. Freedom of movements of the arms and fingers is permitted, and yet the boxing glove presents a thumb too large to get into the mouth. If the child understands that the boxing gloves are not placed on the hands as punishment, but as a help, and he sincerely desires to break the habit, success is probable.

CONCLUSIONS

1. It is generaliy agreed that thumb-sucking or finger-sucking may be an etiologic factor in malocclusion in either the deciduous or the permanent denture.

2. Of 989 cases of malocclusion, in 173 cases, or 17.49 per cent, there was a habit of sucking the thumb or the finger.

3. Of 153 thumb-suckers, seventy-eight, or 50.98 per cent, had Class I (Angle), seventy-three, or 47.7 per cent, Class II, and two, or 1.3 per cent, Class III.

4. Of those that sucked the thumb or fingers, in 24.28 per cent the habit persisted one year or less; 60 per cent had broken the habit by the end of the third year, and 10 per cent sucked the thumb ten years or longer.

5. Malocclusion of the deciduous dentition may correct itself after the thumb-sucking habit is broken if normal function of the lips exists. If normal function does not exist, in all probability the malocclusion will persist.

6. Prevention of the habit of thumb-sucking in infancy is advisable.

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WHY FIXED BRIDGEWORK?

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THE title "Why Fixed Bridgework?" might suggest that this paper is a defense of the fixed bridge, and in a sense that is correct. The fixed bridge occupies a somewhat unique place in the field of restorative dentistry. Probably no other form of dental restoration has been more severely criticized at various times during its history than has the fixed bridge, but, in spite of criticism, in spite of its limitations, in spite of the numerous attempts to devise restorative appliances to supplant it, the fixed bridge still holds its place as an important and useful means of replacement of prematurely lost teeth.

I shall by no means attempt to convince those who condemn all forms of fixed restorations that their views are erroneous, for I fully realize that such an attempt would be futile. The majority of those who are opposed to the fixed bridge are sincere in their convictions, and their convictions are frequently the result of having seen or experienced failures in this method of restoration. To those who are sincere in their convictions and who have found an adequate substitute for the fixed bridge I have nothing to say unless it be "More power to you."

In spite of a very marked progress in the field of the partial denture, especially in both clasp and saddle design and construction, and also progress in designing frictional attachments, I maintain that there are many cases in which the use of the fixed bridge is definitely indicated, and that in those cases where it is indicated, if it is properly designed and well constructed, it will more nearly meet the requirements of physiologic function, of esthetics and of comfort and convenience than any other type of restorative appliance.

I also appreciate the advantages possessed by various types of removable bridgework, especially those employing the so-called precision attachments. The well-constructed removable bridge in those cases in which its use is indicated is, to my mind, one of the finest types of restorative appliances. There is no question that the fields of application of the two, that is, the fixed bridge and the removable bridge, overlap in certain types of cases, and in those cases the selection of method is largely a matter of choice on the part of the patient and the operator. It is unfortunate that, in the past, an issue was raised between fixed and removable bridgework that so beclouded the fundamental principles that the profession has been left in doubt about the value of both methods. The contention, however, that there are fewer failures with removable bridgework is not well taken, for the number of men using frictional attachments to any extent is entirely too small to be compared to the number using the fixed bridge.

We cannot honestly deny that there are too many failures in fixed bridgework. There is, however, considerable doubt as to whether the percentage of failures is any higher than it is in other forms of restorative practice. One thing

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is quite apparent, and that is that failure with the fixed bridge is frequently more disastrous than failure with other types of restorations. Loosening of the individual inlay or crown is usually noticed almost immediately by the patient, while an inlay or crown that is attached to a bridge may be loose for a considerable time before the patient is conscious of the fact. Not infrequently, almost the entire dentin of a crown has been destroyed by caries before the patient is aware that trouble has developed.

While failures of this nature are discouraging to the dentist and distressing to the patient, I do not feel that we can condemn the principle of fixed bridgework because of failures any more than we can condemn the removable bridge or the partial denture because some of them fail, and in their failure cause the destruction and loss of teeth. There is no ideal method of replacing prematurely lost teeth, no method yet devised that does not jeopardize to some extent the remaining natural teeth or the tissues of the mouth. When teeth are replaced by any method, the remaining natural teeth or the tissues must assume the burden of those lost. We may as well be honest with ourselves and with our patients and face the fact that this additional burden will shorten the lives of the units which must carry the load of the restorative structure.

Our great problem, and one to which we must give careful study and thought, is selection for the individual case of that method of replacement which, during the time that the bridge is in service, will cause the least injury. This is by no means an easy problem. The conditions are so wide in their variation and the requirements so exacting that even the most skilful and conscientious will occasionally encounter difficulties that are trying, to say the least.

It is unfortunate that selection of a method is frequently determined by the dentist's prejudice or the patient's whim rather than by careful study and diagnosis. From a theoretical standpoint, every prematurely lost tooth should be replaced by an artificial substitute just as soon after the loss as the restoration can be accomplished. The human dentition is such a wonderfully coordinated mechanism that the loss of even a single unit

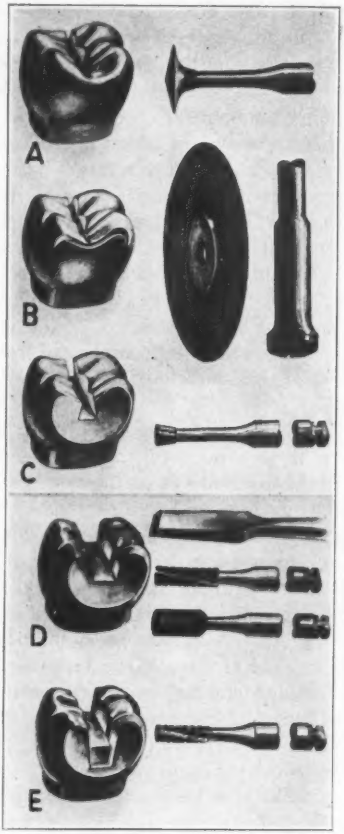

Fig. 1.—Successive steps and instruments used in the preparation of minimum form for molar.

may so disturb the interrelationship of the whole that impairment and loss of function follow. It must be realized that any method of replacement may cause injury to the remaining natural teeth or tissues of the mouth, and the dentist

should be sure before restoration is attempted that the method selected will cause less damage than the presence of an edentulous space. I am inclined to believe that the profession today is more keenly aware than in the past that many of the distressing mouth conditions of adult life are the result of early loss of teeth. While we are perhaps more conscious of the injury caused by the early loss of permanent teeth, especially the first molars, we are still a long way from the solution of the replacement problem in a large number of these cases.

From clinical observations, I am convinced that greater damage to the adult dentition is caused by the loss of posterior teeth during that period of life when replacement is most difficult and most dangerous than later in life. That is, loss of posterior teeth before the twentieth year is likely to result in far greater damage to the entire dentition than their loss later in life. During this period, replacement by fixed bridges or by any means that requires the cutting of teeth is definitely contraindicated because of insufficient calcification of the teeth that must be used as abutments. In spite of the development of dimensional casting, and the use of the so-called hard alloys, it is frequently practically impossible to prepare abutment teeth with sufficient retention to carry a replacement structure without producing retrogressive changes in the pulp. I say "practically impossible": that is perhaps too broad a statement; for conditions vary, especially in regard to the degree of calcification and the anatomic form of the abutment teeth. Certainly no tooth should ever be used as an abutment for any type of replacement appliance that requires destruction of tooth tissues until some time after its roots are completely formed. Since the roots of the second molars very often do not attain their full length until the seventeenth or eighteenth year, the problem of supplying missing first molars before this age is a serious one. To design and construct any type of removable appliance that will not be a menace to the remaining teeth, and that will be worn by these young patients, is difficult. It has been my experience that young patients, as a rule, are none too conscientious either in wearing or in properly caring for removable structures that replace only posterior teeth. The high susceptibility to caries during this period of life is an important factor, and even the most perfectly designed clasps may cause serious destruction of tooth tissue.

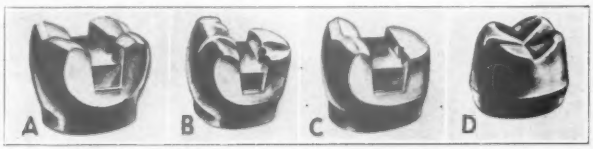

Fig. 2.—Modifications of minimum form.

The question naturally arises: If both fixed and removable bridgework are contraindicated in these cases, what can be done to prevent impairment of dentition when teeth have to be removed during this formative period?

I must confess that I have raised a question for which I have no adequate answer. Some form of orthodontic appliance, when properly constructed and cared for, comes nearer the solution than a prosthetic appliance. One thing that the dentist must constantly bear in mind, regardless of the age of the patient, is that no form of restorative structure should ever be placed in the mouth of a patient unless the dentist is convinced by a careful study of the case that the benefit to be derived by the patient from such

a structure will outweigh possible injury to the remaining natural teeth or tissues of the mouth.

It is a sad commentary on modern restorative dentistry that many sound teeth are lost in our attempts at replacement. Whether more are lost from the ill-advised use of fixed bridgework than from other methods of replacement is a question on which there are to my knowledge no adequate data. I am inclined, however, to believe that poor judgment in application and faulty technic in construction of the fixed bridge have caused the destruction of more teeth than with

Fig. 3.—Two proprietary non-rigid attachments.

other methods. This cannot justly be charged to the method, but is rather a reflection upon the judgment and ability of those who attempt to use it. I say "judgment and ability" advisedly. I am convinced that lack of judgment both in regard to its application and in regard to design and construction is responsible for a greater number of failures than is lack of operative skill. Any dentist who has the ability to make good individual inlays can easily master the technic of the fixed bridge. One who cannot produce good individual inlays should not attempt fixed bridgework. Lack of judgment and either ignorance of or a total disregard for the limitations of the fixed bridge have done more to discredit this method of replacement with both the laity and the profession than have all of the arguments of the most rabid exponents of the so-called "systems" of replacement.

The fixed bridge is by no means a panacea. Its field is more limited today than it was a number of years ago. In the not too distant past, we frequently encountered cases in which an entire arch had been restored by a fixed bridge supported by only four or five abutments. The fact that many of these extensive restorations afforded service for a number

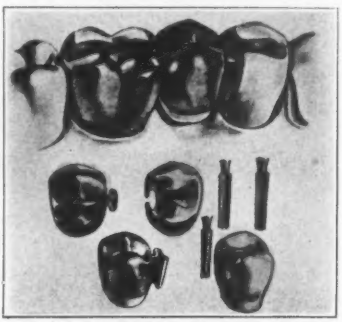

Fig. 4.—Simple dovetailed non-rigid attachments.

of years is by no means an indication that such a procedure would be considered good practice today. These extensive fixed bridges, however, demonstrated that some of the arguments heard in condemnation of the fixed bridge are not valid. They demonstrated that, in the normal adult human mouth, certain teeth can withstand considerable overload and survive for a number of years. They also demonstrated that the functional movements of teeth may be greatly restricted without causing, as some have maintained, immediate destruction of the supporting and investing tissues.

Critical analysis of many failures that have been attributed to partial fixations will show that failure was due not to restriction of movement, but to the overloading of roots ill-designed by nature to withstand overload, or to forcing a tooth to assume a movement that is abnormal in direction.

Quite frequently, it is difficult to distinguish between overload and abnormal movement, for the two may be present at the same time. For instance, the loosening of the maxillary lateral incisor roots when they are used as abutments for a bridge supplying the central incisors is undoubtedly due to overload. The lateral root in a large number of cases is neither large enough nor sufficiently well supported to withstand any amount of overload, and when two lateral incisors are forced to assume the additional burden of the central, the load is too great. I do not believe that, in this case, partial restriction of the movement of the lateral incisors is a factor of any importance in the breakdown of their supporting tissues. It is simply a case of overload.

On the other hand, we occasionally see restorations of a central incisor made by the simple suspension of a facing from the remaining central. Almost invariably, the abutment loosens within a comparatively short time, not so much from overload as from abnormal movement. The suspended facing acts as a lever to rotate the abutment root in its socket, and the shape of the central root is such that it cannot withstand rotational stress. In most cases, if the central incisor root is of normal length, a simple form of stress-breaker on the lateral incisor will suffice to prevent rotation and loosening of the abutment root.

As I have previously stated, the field of fixed bridgework is more limited today than it was in the past. The restriction of the field is due to a greater appreciation of the biologic and mechanical requirements in this type of service. Many restorations that in the past were considered good practice would not be tolerated today. The argument that was prevalent not many years ago about the relative cleanliness of the fixed and the removable bridge should have no application to the modern fixed bridge. Unless a bridge is so constructed that a patient can keep it in the same state of cleanliness as his remaining natural teeth, it should never be fixed in the mouth. We must realize that there are many cases in which the anatomic form of the teeth, their position in the arch and the character of the soft tissues are such that a fixed bridge cannot be constructed in such a way that it can be kept in the same state of cleanliness as the remaining natural teeth.

VITAL TEETH AS ABUTMENTS

Probably nothing has caused a greater restriction of the field of the fixed bridge than the almost universal use of vital teeth as abutments. While the well-filled pulpless root is still used, the majority of fixed bridges today are supported by vital abutments. In spite of marked improvement in both cavity preparation and casting technic, we are, we must frankly admit, unable to secure with modern forms of attachment either the amount of retention or the degree of protection that the older forms of attachments used on non-vital teeth afforded. With the pulpless root, adequate retention by means of posts is a comparatively simple matter, as is protection of the tooth against fracture and subsequent decay. With the vital tooth, we are confronted with a far more difficult problem. Retention must be

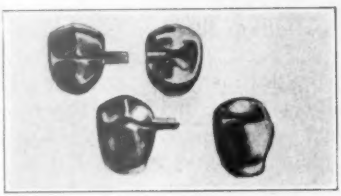

Fig. 5.—Slot and lug type of non-rigid attachment.

gained by some form of grasp in or on only the coronal portion of the tooth, and in addition to protection against fracture and subsequent decay, the preparation must be made in such a manner that the health of the dental pulp is not jeopardized.

When we consider the wide variation in the anatomic form of crowns, the difference in calcification of the teeth and the amount of stress to which an attachment may be subjected, it is apparent that it is in some cases a physical impossibility to meet these requirements, and, as a result, a restoration of some other type than a fixed bridge is indicated.

For some time, I have been convinced that most failures in fixed bridgework are due to a lack of appreciation of the limitations of the vital tooth as an abutment, especially in regard to the retentiveness of various types of castings that may be used for bridge attachments. Apparently, many dentists who are attempting to use fixed bridgework supported by vital teeth do not realize that an inlay which may serve for an individual tooth restoration, or even as an attachment for a removable bridge employing frictional attachments, may be practically useless as an attachment for a fixed bridge.

Whenever a pontic is rightly attached to a casting, it acts as a lever, not only placing tortional stress upon the casting during lateral movements of the mandible, but also exerting a pull or dislodging stress during the mastication of sticky foods. We must bear in mind that the area of contact with these sticky foods is far greater on the pontic than on the inlay or even the crown supporting the pontic, and consequently we must have much greater retention for the bridge attachment than for the individual tooth restoration.

INLAYS AS BRIDGE ATTACHMENTS

Numerous attempts have been made to measure the retentive force of various types of castings. While such experiments are interesting, the conclusions reached in laboratory tests have not always coincided with experience in actual practice. With the vital abutment, attachments are held in place by two types of frictional retention. Internal retention is gained by the grasp of the dentinal walls upon the casting. The simple occlusal inlay is held in place not by cement alone, but also by the grasp of the cavity walls on the casting. External retention is that type which is secured by the grasp of the casting on the prepared walls of the tooth. The best example of this force is seen in the full crown. In the mesioclusodistal inlay, we have a combination of the two forces, both external and internal. In the occlusal step, we have the grasp of the dentinal walls against the casting, and, on the proximal surfaces, we have the grasp of the casting against the axial walls of the cavity. If, in outlining the preparation of teeth for bridge attachments, we analyze these retentive forces, we can frequently modify the preparation to make more efficient use of one or the other force without greater destruction of tooth tissue.

It is my contention that the mesioclusodistal inlay is the minimum form that will provide adequate retention for an attachment for a posterior fixed bridge in the majority of cases. I say "minimum form" advisedly; for, in many instances, a simple mesioclusodistal inlay will provide neither adequate retention nor adequate protection to the abutment, and consequently must be modified to meet these requirements.

The two-surface inlay as it is usually prepared is not a safe form of attachment for a pontic. The retention of the two-surface inlay is secured almost entirely within the occlusal surface of the tooth. To obtain sufficient retention to support a bridge, it is necessary either to prepare a dangerously deep occlusal dovetail or to groove the buccal and lin-

gual walls of the proximal portion to such an extent that they are likely to be weak and susceptible to fracture when subjected to the tortional stress applied by the pontic. I also maintain that, in most instances, the mesioclusodistal inlay or some of its modifications can be prepared with less actual danger than can the two-surface casting having the same retentive force.

There has been some discussion in regard to the amount of tooth tissue destroyed by various types of preparations. Recently, this discussion has centered about the slice type of cavity and the older conventional box type. The amount of tissue destroyed is important only in relation to the location of the area from which the tissue is removed. We are all familiar with the sensitivity of relatively thin castings near the gingival portion of the tooth. The same amount of metal in the occlusal portion of a tooth will cause far less thermal shock and consequently be less injurious to the pulp than when applied to the gingival third of the crown.

While the slice preparation may actually remove more tissue in some instances, the tissue so removed is from areas that are not so susceptible, especially to thermal shock, as are those with the box type of cavity. There has been severe criticism, however, of the slice preparation, and there is little doubt that much of this is justified. The criticism, however, should be directed to the way in which the preparation is made rather than to the form itself. Damage to the contact points of approximating teeth, formation of incorrect angles of axial surfaces and laceration of the soft tissues are the result of poor operative technic. With proper instruments and proper technic, the slice preparation can be made in less time and with minimum trauma to the tooth and minimum discomfort to the patient. The elimination of shoulders at the cervical margins and of excessive convexity on the mesial and distal aspects is of great advantage, not only in securing accurate impressions, but also in fitting castings and finishing margins.

As I have stated previously, I consider the mesioclusodistal the minimum form for a fixed bridge attachment. I also stated that this minimum form must be modified to meet certain individual variations. Some of the more important considerations in modification of the minimum form may be listed as: (1) the structure of the abutment tooth; (2) the amount of stress involved; (3) the previous destruction of tooth tissue by caries or previous restorations, and (4) the position of the abutment.

With the exception of preparations employing pins, the amount of retention, either internal or external, is governed by the length of parallel or nearly parallel walls; that is, the larger and the more nearly parallel the walls, the greater the retentiveness of the casting. With extremely short crowns, it is frequently impossible to secure walls of sufficient length to insure adequate retention for the simple mesioclusodistal cavity. In these cases, it is necessary to modify the preparation in such a manner that a greater area of the tooth is included within the preparation; that is, the buccal or lingual surface of the tooth must be included as in the three-quarter crown, or both buccal and lingual surfaces must be included, as in the full crown.

The amount of stress to be involved must be given careful consideration in the design of the preparation. Conservation of tooth tissue is an important factor, but if conservation of tissue during preparation may mean the loosening of an attachment later, it can hardly be considered true conservation. In general, the greater the stress to which the restoration will be subjected, the larger the area of the abutment crown that must be included in the preparation both for retention and for protection.

Previous destruction by caries or fillings may present a difficult problem from the standpoint of retention and protection. Practically all forms of attachments for vital teeth depend to a large extent on the central body of dentin within the crown for their strength. Whenever this dentin has been destroyed, not only is the crown materially weakened and susceptible to fracture, but also the possibility of securing any amount of internal retention is gone, and to be effective even the full crown must have a grasp on walls possessing considerable strength. Neither cement nor amalgam is an adequate substitute for dentin.

The position of the tooth used as an abutment in the arch is an important factor in its use as an abutment. Rotation or tipping of an abutment usually demands a considerable modification of the standard form of preparation. Not only must the requirements of retention and protection be met, but, in addition, abnormal occlusal relation and loss of proximal contact must be corrected. The correction of the occlusal relation that requires building up or elongation of a portion of the casting needs careful study in relation to the retentive form of the preparation. Both the increased length of the casting and a change in the direction of stress are likely to produce greater dislodging effect than is present when a tooth is in normal position.

The attempt to parallel a badly tipped abutment with another tooth in more normal position will frequently result not only in loss of retention, but also in dangerously deep preparations. This condition is frequently encountered in the replacement of the lower first molar. Owing to early extraction of the first molar, the second molar is tipped mesially and lingually, and often the second bicuspid has a decided distal inclination. The attempt to parallel preparations on these abutments is likely to result in severe destrucfion of the mesial portion of the molar and the distal portion of the bicuspid. Rather than to attempt to parallel the abutment preparations in those cases which may require radical cutting of teeth, some form of a nonrigid joint between the pontic and one of the abutments may be used to advantage.

I rather object to the term "loose joint" because it describes too accurately what happens when bridges of this type are poorly designed and constructed. Too many of the nonrigid joints are so constructed that the pontic and the abutment to which it is attached are allowed too great movement. I prefer the term "semifixed" as describing that type of bridge having the pontic rigidly attached to one abutment and fastened to the other abutment by means of some form of nonrigid joint.

In the last few years, a number of nonrigid joints have been developed. Many of these will provide ample support, and the amount of movement can be controlled by the shape and construction of the joint. To a large extent, the earlier forms of the so-called loose joints consisted of a rod or lug which was either soldered into or cast with the pontic and which rested on the marginal ridge of the rest abutment or in a groove cut into the marginal ridge of an inlay or crown on the rest abutment. When properly constructed, especially in the incisor region, and when the rigid abutment, that is, the one to which the pontic is rigidly attached, possesses an unusually heavy and well-supported root, this type of attachment is adequate for the replacement of a single tooth. It must be kept in mind, however, that unless the lug is well seated in a sharply defined and well-cut groove, it will break only the occlusal stress and may permit too great lateral movement. Even when properly designed, this type of joint transmits all lifting stress to the rigid abutment, and should not be used where the length of the pontic will place much leverage on the rigid abutment.

Prevention of lateral stress, together

with resistance to occlusal stress, may be accomplished with several dovetail forms that can be easily constructed. There are also a number of proprietary forms on the market that are quite useful in certain cases. Personally, I favor the use of the simplest form that will assure the desired result, and I use but one proprietary attachment to any extent. One of the proprietary attachments, because of its sharp angles, provides sufficient rigidity to be used in cases where lateral movement is undesirable and where the semifixed bridge is indicated to prevent excessive cutting in paralleling attachments.

In addition to the fact that the semifixed bridge may be used to prevent excessive cutting in paralleling of attachments, it possesses other marked advantages in certain cases. As I stated previously, clinical experience does not bear out the contention that the partial restriction of functional movement that follows the application of the well-designed and properly constructed fixed bridge is injurious to the supporting structures of abutments. It is undoubtedly true, however, that a more nearly ideal physiologic condition results when restriction of movement is kept at the minimum; and except in those cases where restriction of movement is desirable as a therapeutic aid in supporting teeth loosened by a traumatic condition of the occlusion, there is some advantage to be gained by allowing a slight individual movement of the abutments. This is especially true where abutments of dissimilar functional movement are included in the same fixture. In such cases, the semifixed bridge with a properly designed nonrigid joint will allow slight individual movement of the abutments and prevent the discomfort that frequently follows the application of a bridge employing two or more rigid joints.

I have used the term "slight movement" with some fear of being misunderstood. There is considerable misconception in regard to the amount of movement that is desirable. In the past, a large number of loose joints have allowed entirely too much movement, and have thrown practically the entire stress of the bridge on the rigid abutment. To prevent this, it is necessary to use a dovetailed preparation, not just in the occlusal portion of the rest abutment, but one that extends into the proximal portion of the casting and affords a definite seating and lock for the male portion of the joint. The amount of movement can be controlled by the shape of the dovetail preparation, and should be so slight that it is scarcely perceptible to the naked eye.

The argument that the feeling of strain and discomfort following the setting of a bridge employing two or more rigid joints is due to faulty technic in either the preparation of the abutments or the construction of the bridge is, of course, valid. It does occur too frequently in spite of our most conscientious efforts, and its existence is a menace to the abutments.

For several years, we have been using in the clinic of the School of Dentistry at the University of Michigan the nonrigid joint in a comparatively large number of restorations. While there has not been sufficient time to draw definite conclusions, I must say that the results to date have been very encouraging.

NECK INFECTIONS OF DENTAL ORIGIN

By Arthur M. Alden, A.M., M.D., F.A.C.S., St. Louis, Mo.

THREE years ago, before the American Society of Exodontists and Oral Surgeons, I presented some new ideas about the treatment of neck infections of dental origin. The paper was based upon twenty-nine consecutive cases of this condition operated upon without a death, a tracheotomy or development of an osteomyelitis of the mandible. Since that time, I have seen thirty-five more cases. So this paper is based upon sixty-four consecutive, surgically treated cases of infection involving the fascial planes of the neck, each of which began as a dental lesion. This does not include a much larger number of cases of neck infections of dental origin in which there was recovery after adequate medical treatment, without surgical intervention. This series is still without a death or the development of an osteomyelitis of the mandible, though in one of the more recent cases, tracheotomy was required because of a rapidly developing edema of the larynx.

Deep neck infection has ever been and probably will always be the major complication associated with dental disease in the lower jaw. The flushed dry skin of the anxious-eyed patient, the rapidly spreading brawny enlargement of the neck, the edema in the floor of the mouth pushing the tongue upward against the hard palate, the guttural attempts at speech and the labored respiration make a clinical picture so ominous that once seen it will never be forgotten. The mortality in such cases has unfortunately been entirely too high, and it was this high mortality in a group of these infections occurring in a hospital where I was in attendance many years ago that first aroused my interest in this problem. Today, it is my firm belief that the great majority of fatalities from this type of infection can be avoided.

In the cases reported here, the location of the infections was as follows: submental, 7; submental and submaxillary, 5; submaxillary, 21; submaxillary and parapharyngeal, 14; parapharyngeal, 14; subparotid, 3.

To the surgeon who has an adequate comprehension of the ramifications of the cervical fascia, there should be no mystery as to the exact location of a pus pocket in the neck, nor any doubt as to the easiest method of draining it. Pus does not locate "just anywhere" in the neck, but forms in certain definite areas. The function of the cervical fascia is to bind together the various anatomic elements of the neck, and its structure is such that the neck is divided into a series of planes and potential compartments. By the term "potential compartments," I mean certain spaces which, under normal circumstances, are not open cavities, but which, when invaded by an abscess, become true compartments because of the limiting action of the various fascial planes and other structures on their several sides. In a paper like this, it is unnecessary to describe in detail all of these spaces, only the most important ones for our purposes, i.e., the

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submental, the submaxillary and the parapharyngeal, calling for description.

The submental space lies underneath the tongue and above the level of the mylohyoid muscle, which forms the diaphragm in the floor of the mouth and extends from the symphysis of the mandible in front to the body of the hyoid bone behind. Laterally and posteriorly, this space may connect with the submaxillary space at the anterior end of, and just above, the submaxillary gland. Infection in this submental space was described by Ludwig many years ago and it is still called "Ludwig's angina." The disease in this region usually originates as a dental infection in the front of the lower jaw or by extension forward from a submaxillary abscess behind. In the older publications, the mortality from infections in this region was given as from 20 to 40 per cent. Today, in the light of our knowledge of such conditions and modern methods of treatment, fatalities resulting from this type of abscess should be rare.

The submaxillary space lies just inside and below the mandible, and in it rests the submaxillary gland, like an egg in a nest. Across and externally from the gland runs the facial vein, and underneath the gland lies the facial artery, the hypoglossal and superior laryngeal nerves. Just below and behind this gland is the most important and accessible surgical landmark on the lateral wall of the neck, the posterior cornu of the hyoid bone, the little horseshoe-shaped floating bone situated above the upper border of the thyroid cartilage and to which is tied practically all of the "guy wires" of the neck. Occasionally, in the presence of marked swelling, this bone cannot be palpated from the outside, but when any sizable opening is made in the lateral wall of the neck, its location can soon be determined by thrusting a gloved finger through the incision. Infection in this region is more frequently secondary to disease of the lower molars.

The parapharyngeal or pharyngomaxillary space may be considered as a cone, the base of which is at the base of the skull around the jugular foramen and the apex of which is at the tip of the hyoid bone. Below is the submaxillary space. The inner border of the parapharyngeal space is the superior constrictor muscle with the tonsil attached to it. The bulge of this muscle and its attached tonsil into the throat in the presence of an abscess in this region is frequently mistaken for evidence of a peritonsillar infection. The outer border below is the internal pterygoid muscle lining the inner surface of the ascending ramus of the jaw and matching the masseter muscle on the outside. The outer border above is the parotid gland, the gland at this point not being covered with fascia. Abscess in this region is as a rule due to disease of the lower second or third molars.

Mosher has pointed out the fact that, for practical purposes, the fascia surrounding the great vessel sheath as it emerges from the apex of the parapharyngeal space and the posterior end of the submaxillary space continues as a potential space downward into the thorax. He calls this the "Lincoln highway of the neck." Theoretically, large accumulations of pus in this region should frequently gravitate downward into the upper mediastinum. Actually, such a complication is very rare.

From the beginning, we were deeply interested in the bacteriology of these infections and so, with a few exceptions, when the cultures have been lost or unsatisfactory, all of our cases have been studied from smears and cultures, both from the original lesion and from the pus released at the time of operation. Very early in our work, we were struck by the fact that although there were usually several forms of micro-organisms present, *Spirochaeta vincenti* was easily the predominating one. In this group, it was found to be the principal invader

fifty-two times in fifty-eight cases. Six cases had no cultures. In sixteen cases, it was the only organism reported. In thirty cases, it was found in symbiosis with a streptococcus; in three, with a staphylococcus, and in two, with a streptococcus and the colon bacillus.

The organisms shown by culture and smear were as follows: *Spirochaeta vincenti,* 16; *Spirochaeta vincenti* and the streptococcus, 30; *Spirochaeta vincenti* and the staphylococcus, 3; no culture, 6; *Spirochaeta vincenti,* the streptococcus and colon bacillus, 2; the streptococcus and the staphylococcus, 1; the streptococcus, 5; *Spirochaeta vincenti* and the colon bacillus, 1.

TRISMUS

Location	Cases	Slight	Moderate	Complete	None
Submental	7				7
Submental and submaxillary	5				5
Submaxillary	21	6	4		11
Submaxillary and parapharyngeal	14	1	9	4	
Parapharyngeal	14		6	8	
Subparotid	5		2	1	

When it was recognized that this organism was probably the most important factor in the invasion of the deep structures of the neck by disease, it seemed logical to combat the infection by means of neo-arsphenamine intravenously. All but four of our patients have received one or more doses of this drug. The results were many times almost spectacular. On several occasions, we have seen the rapid spread of a diffuse cellulitis of the neck stopped, localization beginning within twenty-four hours after the administration of the drug. As a result of this experience, it has become a routine on our service to give all patients suffering from infection the origin of which was a dental lesion an intravenous dose of 0.4 gm. of neo-arsphenamine immediately after admission to the hospital. This is done even though examination of smears from the original lesion in the mouth is inconclusive as regards Vincent's organisms. I am of the opinion that this procedure is one of the most important factors in the successful treatment of this group of cases.

Trismus, which is frequently an annoying accompaniment of these neck infections, is almost invariably the result of an irritative spasm of the internal pterygoid muscle on the affected side due to the presence of infection in the parapharyngeal space in direct contact with the muscle. This statement would suggest that trismus would be very rare when the disease was limited to the submental or anterior submaxillary spaces, and this has been true in our cases. In this group, there were twelve cases of abscess limited either to the submental region or to the submental and submaxillary regions. In none of these cases was trismus present. In every case in which the infection had invaded the parapharyngeal space, which, as you will recall, is limited in its downward and outward aspect by the internal pterygoid muscle, trismus was present. In fourteen cases, it was so marked as to make proper examination of either the original site of the lesion or the posterior pharyngeal wall impossible. In other words, to turn this fact around, we may say that, in such an infection, when trismus is present, its occurrence should make the surgeon aware that the parapharyngeal space has probably been encroached on.

In treating cases of neck infection, there are several secondary complications that must ever be kept in mind as important potentialities.

Osteomyelitis of the mandible has, in the past, been a frequent result of infections starting in the posterior portion of the lower jaw. In many of our cases, as the result of either the disease or the surgical procedure to eradicate it, a large portion of the surface of the mandible has been stripped bare of

periosteum; yet in no case has an osteomyelitis developed. The entire absence of this complication in our group of cases, most of which were treated with neo-arsphenamine intravenously, would seem to suggest the conclusion that these two facts are not entirely unrelated.

Edema of the larynx is a complication that may occur at any time to any patient with an abscess in the neck. When it starts, it progresses rapidly and, if not treated promptly by tracheotomy, terminates the case in a few hours. In such cases, tracheotomy should never be performed as an emergency procedure; for careful watching of the patient will allow the surgeon to anticipate the emergency long before it actually arrives. A planned tracheotomy subjects the patient to little discomfort and no risk, while the same operation as an emergency is dangerous and all too frequently futile.

There is a type of neck infection that it is often difficult to recognize for what it really is. It may begin as a very mild affair with little or no fever and perhaps only a transient swelling or soreness in the neck. A few days later, the patient has a chill or a series of chills and presents the symptoms of general sepsis. In the concern over the alarming picture now presented by the patient, the incident of the trivial infection in the mouth or throat may be forgotten. In such a series of events, the sepsis is almost invariably due to an infective thrombophlebitis of the internal jugular vein or one of its branches. A careful exploration of the vein and its tributaries should be made at once, and if infection is found, the vein should be ligated. Such a ligation can be and frequently is made without in any way endangering the welfare of the patient.

I am frequently asked, "Is surgical disturbance of a lesion in the mouth a necessary precursor to extension of the infection downward into the neck?" The answer is definitely no. In nineteen of our patients, no surgical procedure was instituted, and the neck infection occurred merely as a direct extension of the dental involvement into the deeper tissues. Forty-five cases were preceded by some form of dental surgery. Our routine for such patients is, we believe, an important factor in the results that we are able to report here today. All are immediately hospitalized, and because many of them reach us after days of unsuccessful treatment, they present not only surgical, but also medical problems. Frequently, owing to the trismus or swelling in the throat, swallowing has been impossible and the patient is markedly dehydrated. This is combated at once by giving fluids intravenously or by a nasal feeding tube, continuing until the patient can take enough fluids and food in the normal manner to satisfy his needs. Neo-arsphenamine in doses from 0.3 to 0.5 gm. is given, the dosage depending on the weight and condition of the patient. When the hemolytic streptococcus is found to be present, sulfanilamide in full dosage by weight is given by mouth at four-hour intervals. Administration of 2 grains of methylene blue with each dose helps greatly in preventing the methemoglobinemia that so frequently follows the use of this drug. I am of the opinion that sulfanilamide is definitely indicated in any case of neck infection where the beta hemolytic streptococcus can be recovered either from the original lesion or from the pus released at operation. In our hands, it has not been effective in infections due to the alpha or nonhemolytic group of streptococci.

Many patients with neck infections treated by the régime outlined above respond promptly, the symptoms subsiding one by one until convalescence is complete. In another group of patients, because the location of the infection makes spontaneous drainage impossible or the virulence of the organism overwhelms the tissue resistance of the patient, ade-

quate general treatment serves only to limit the spread of the disease, and an abscess develops. When, in spite of well-carried-out medical treatment, there is reason for the belief that a localized collection of pus exists, operation is indicated.

Selection of the time for operation is an important detail. Earlier in our experience, we were prone to wait, if possible, until deep fluctuation was evident on palpation of the soft tissues of the neck, but this delay was responsible for the near demise of two patients. Mosher makes the statement that to wait for fluctuation is to invite secondary complications, and I am entirely in accord with this point of view. On the other hand, since these infections in the neck almost invariably begin as a diffuse cellulitis, it is always advisable to give the patient the benefit of neo-arsphenamine or sulfanilamide therapy before operation. The action of either or both of these drugs, the choice depending on the bacteriologic findings, is usually to limit the spread of the infection and convert it into a walled-off abscess. When this has been accomplished, operation is indicated, but not before.

In all such cases, operation should be performed under local anesthesia because the use of general narcosis on a patient whose airway is already mechanically embarrassed, or to eliminate or weaken with an opiate his cough reflex, is invariably fraught with danger. Procaine infiltration, both superficial and deep, renders the operation painless, and, at the same time, insures the operator of the full cooperation of the patient in what is frequently a difficult situation.

The type and extent of the incision depend entirely on the location of the pus. If it is clearly submental without involvement of the adjoining submaxillary fossa, a midline neck incision down to and through the mylohyoid muscle will satisfactorily drain such an accumulation. Occasionally, when the abscess is located immediately under the front of the tongue, it can be drained by an intra-oral incision. If the submaxillary fossa or the submaxillary and the parapharyngeal region have been invaded and exposure of this area is indicated, the Mosher T-shaped incision exposing the submaxillary gland and then retracting it upward out of its fossa allows adequate exploration of the entire region. Through this exposure, the gloved finger or an artery clamp pushed upward and backward will enter the parapharyngeal space, and posterior retraction will expose the vessel sheath containing the carotid and internal jugular vein.

This incision in our hands has given most satisfactory results. I do not believe in small incisions for exploration in the presence of a potentially fatal infection. Much better a live patient with a scar on his neck than a corpse with only a trivial cosmetic defect. In a few of our cases, it was possible to drain satisfactorily a superficial submaxillary abscess or an anterior parapharyngeal abscess by intra-oral incision, but by far the safer procedure in the majority of cases is the external approach.

After the abscess has been thoroughly opened and emptied, the cavity is packed with a strip of dental rubber 2 inches wide and as long as is necessary. In the end of this rubber strip that is to be inserted into the depths of the abscess cavity, a single knot is tied. The contraction of the tissues around this knot keeps the drain from slipping out until its removal is desired. As the wound heals from the inside, the rubber strip is gradually withdrawn and is cut off at the dressings. No case of salivary fistula has resulted from the use of this form of dressing and the cosmetic results have been entirely satisfactory.

CONCLUSIONS

1. Abscess involving the deep structures of the neck is a not infrequent com-

plication of dental disease of the lower jaw.

2. In our series of cases, *Spirochaeta vincenti* and the hemolytic streptococcus were the most common bacterial invaders, and appropriate treatment by the use of neo-arsphenamine or sulfanilamide or both has contributed materially to the ultimate results.

3. When the infection is definitely localized, surgical drainage is indicated, not before.

4. Appropriate, well-timed and adequate surgical drainage in neck infections, after well-carried-out medical therapy, has obviated fatalities in all of our cases.

5. All such operations should be carried out under local anesthesia.

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SURGICAL CASE HISTORIES

By T. A. Hardgrove, D.D.S., Fond du Lac, Wis.

THE short case histories and accompanying illustrations are presented for their possible value to the general practitioner. They are the type of cases passing through his hands, many escaping correct and early diagnosis and terminating disastrously as a result of delayed and improper treatment. The important thing in the practice of dentistry as well as in the practice of medicine is early and correct diagnosis. That, in itself, indicates the treatment which will usually result in cure of these cases if instituted early enough.

REPORT OF CASES

Case 1 (Figs. 1-2).—A man, white, aged 27, married and the father of two healthy children, first discovered his condition June 1, 1932. The patient was rather tall and slender, with a pale appearance due to some extent to the fact that he worked at night as a clerk in a hotel. The diagnosis in the beginning was Vincent's infection. Later, after some treatment, it was discovered that the nasal cavity was affected, but the diagnosis remained the same. There was no particular evidence to support this diagnosis, since the Vincent's organisms in this case were no more numerous than in a great many normal mouths. The condition did not yield to the treatment for Vincent's infection in either the nasal cavity or the oral cavity.

After some effort, it was discovered that this was one of the fungus, or so-called yeastlike, infections. The exact classification of it was *Endomyces vuillemini*. It was persistent in its attack, not yielding to treatment until gentian violet, the x-rays and large doses of potassium iodide were used, whereupon it yielded immediately, so completely that the patient decided he was entirely cured. But the fungus infections have a tendency to disappear as far as appearance and symptoms are concerned, only to remain in the tissues for a time and appear later in the same or some other part of the body. This case was no exception.

The patient believed that he acquired the infection from eating oranges and other fruits. He thought that the infective agent was on the fruit, since he ate more fruit than the average person and could account for the infection in no other way. Since it is a disease that is seen more commonly in the southern than in the northern part of the country, it is probable that that was true.

The patient made a complete recovery and remained well for two years. However, before the disease could be brought under control, it had destroyed part of the ethmoid bone and the wall of the right antrum so

that pieces of bone could be picked out in shell-like pieces, and the entire antrum remained collapsed or without an external wall.

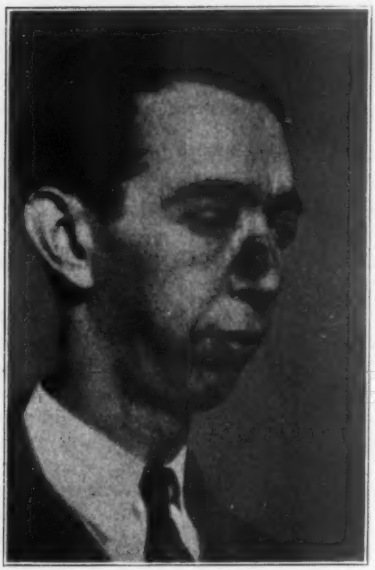

Fig. 1 (Case 1).—Endomyces vuillemini.

Fig. 2 (Case 1).—Endomyces vuillemini; after treatment.

After two years, the trouble returned, attacking the inner wall of the nasal cavity and causing a perforation. The standard treatment was not used because the patient had drifted into other hands owing to the fact that the dentist treating him during the first attack was not available. That there was a fungus infection did not seem likely to the physician who treated him, and treatment was not given for it. It was later demonstrated that the fungus was the actual cause of the trouble, but it had advanced

Fig. 3 (Case 2).—Monilia albicans.

Fig. 4 (Case 2).—Monilia albicans (after treatment).

so far that treatment was of no avail. The patient died of an invasion of the endomyces into the cranial cavity, during which the infection destroyed the right eye and the tissues back of it. Death ensued February 23, 1937.

Case 2 (Figs. 3-4).—A man, white, single, aged 25, had a *Monilia albicans* infection which resulted in a very large, hard, boardlike swelling of the entire face on both sides,

Fig. 5 (Case 3).—Yeast fungus.

Fig. 6 (Case 4).—Black tongue.

forehead and tissues of the neck; and a general attack upon the connective tissues of the abdomen, body, arms and legs. While iodine is usually given for all fungus infection, in this case potassium iodide did not bring about a cure. The condition did yield, however, to arsphenamine, the maximum dose given being 0.45 gm., and a total of eleven doses being administered. The Wassermann reaction was negative. The patient remained well for a year and one-half, then developed an aleukemia, which resulted in death. This patient was careless in his habits

Fig. 7 (Case 5).—Vincent's osteomyelitis.

Fig. 8 (Case 6).—Yeast osteomyelitis.

and may have received the infection from stale bread.

Case 3 (Fig. 5).—A woman, aged 32,

married and mother of one child, had an infection with *Saccharomycetaceae,* another form of yeast infection which is persistent in its nature. It required four or five months to bring the infection under control.

All of these cases of fungus infection should be watched for four or five years and treated many times even in the absence of local demonstration.

Fig. 9 (Case 7).—Ludwig's angina.

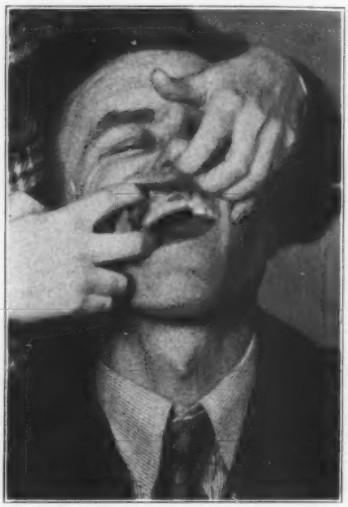

Fig. 11 (Case 9).—Lead poisoning.

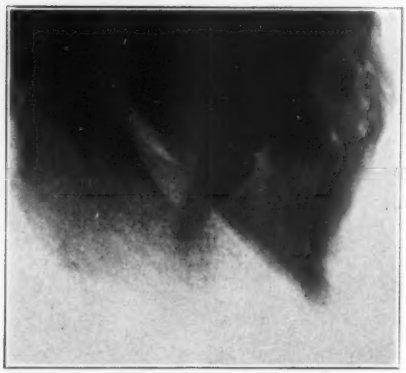

Fig. 10 (Case 8).—Sulfur granules (actinomycosis).

Fig. 12 (Case 10).—Tetanus (lockjaw).

Case 4 (Fig. 6).—A man, aged 45, married, had a condition which was suspected to be so-called black tongue, but proved to be nothing more than a yeast infection, the

result of drinking home brew beer. It responded to treatment with potassium iodide, gentian violet and mercurochrome applied on the dorsal surface of the tongue.

Case 5 (Fig. 7).—A woman, aged 22, had an osteomyelitis which was due to an invasion by Vincent's organisms beneath the periosteum, destroying the bone. The condition yielded to treatment with a mild solution of chromic acid followed immediately by hydrogen peroxide through the openings in the jaw.

Case 6 (Fig. 8).—A man, aged 27, married, had an osteomyelitis the predominating symptom of which was very severe pain. Pus formation in various areas of the jaw called for opening and drainage at different periods. The condition continued until the entire bone was lost and replaced. The treatment consisted of irrigations with hydrogen peroxide and large doses of potassium iodide. The time required for the completion of the treatment and restoration of the jaw was about six months, indicating that osteomyelitis is more frequently caused by yeast infection than we are inclined to believe. When the swelling, pain and symptoms do not resemble the ordinary streptococcus and staphylococcus infection, the possibility of a yeast infection should be considered.

Fig. 13 (Case 11).—Lip epithelioma.

Case 7 (Fig. 9).—A man, white, aged 29, had a case of Ludwig's angina that was treated persistently with sulfanilamide, but finally was opened and had drainage established. Very little pus was discharged, but the patient made a complete recovery. The importance attached to the case lies in the fact that in a true case of Ludwig's angina, sulfanilamide is of benefit when administered early. If it does not entirely cure the case, it will so limit its invasion and development that simple opening will suffice for drainage.

Case 8 (Fig. 10).—A woman, white, aged 35, had a case of actinomycosis. The illustration shows a few specks which were diagnosed as sulfur granules. The case yielded to heroic doses of potassium iodide increasing to as much as 300 grains a day. There was a complete recovery.

Case 9 (Fig. 11).—A man, white, aged 35, married, had been treated for what was believed to be an abscess. The case illustrates very clearly the necessity of taking industrial possibilities into consideration. The pulps in the teeth involved were alive. There was a great cavity over three or four of the teeth, and the scrapings from the cavity looked as if there might have been lead deposits in the tissues. An examination of the urine demonstrated that this was a case of lead poisoning. The patient worked in an automobile body plant. Treatment with potassium iodide was successful.

Case 10 (Fig. 12).—A boy, aged 19, came in for the extraction of a third molar which he believed prevented him from opening his mouth. Examination showed that this was not the case. The patient had a wound on the thumb caused by the closing of the hood of his automobile. The lesion had been treated. The patient was a farmer and there was considerable speculation as to whether the condition might be tetanus. The wound itself was opened and cultured, and, in from twenty-four to forty-eight hours, it was quite easy to tell by the demonstration in the hospital laboratory that it was a tetanus infection. The important feature of this case is that it demonstrates what can be accomplished if diagnosis is made early and the tetanus antitoxin is administered early. The first injection was received April 9 and the patient left the hospital April 19.

Case 11 (Fig. 13).—A man, white, aged 30, married, presented an epithelioma from which yeast fungus was recovered repeatedly. The patient's father had a similar

lesion, which yielded to fungus treatment. This one, however, had advanced to the point where it had to be destroyed with radium.

CASE 12 (Fig. 14).—A man, white, aged 42, had a large tumor that had developed as a result of an injury to the jaw when the patient was a small boy in Germany. The tumor continued to grow until the chin protruded about 3 inches beyond the normal boundary of the jaw bone. There was no particular discomfort except for its appearance until the patient was about 75 years old, when it began to grow back into the space between the halves of the lower jaw and forward on the chin. A metastasis to the ribs developed. The diagnosis was an osteosarcoma, which resulted in death.

Fig. 14 (Case 12).—Tumor on chin.

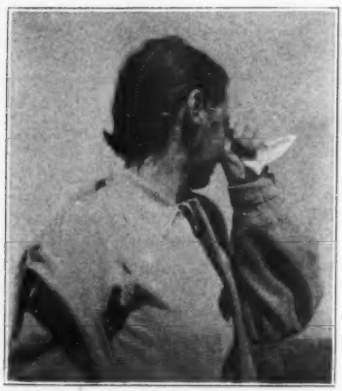

Fig. 15 (Case 13).—Yeast fungus.

CASE 13 (Fig. 15).—A woman, a school teacher, had had discharging sinuses on the side of the face and a general feeling of ill health over a period of several years. She could not work at her occupation. The area involved was to a very large extent soft tissue. The yeast fungus infection present responded to large doses of potassium iodide in the main, although irrigation with gentian violet was given, alternating periodically with mercurochrome.

It is essential to take care of the mixed infection in all of these cases.

While the treatment of each case is indicated in the history accompanying the picture, there are a few general points

that the practitioner should bear in mind, one of which is in the treatment of osteomyelitis. One must not suspect a staphylococcus infection alone, but should realize that Vincent's organisms and the fungus yeastlike organisms can be responsible for osteomyelitis. The operator should bear in mind in the treatment of these conditions that the specific treatment where indicated for that type of organisms is best used, and, further, that in the case of tetanus infection, an early diagnosis will result in the cure of the patient, because early diagnosis means early administration of the tetanus antitoxin; and that the best means of diagnosis is culture of the wound, if possible, from which the infection spread or invaded the tissue.

In the case of actinomycosis, an x-ray picture is of value because it will show pearl-like spots in many instances where the sulfur is dense enough, and, as a general thing, in the treatment of fungus infection, potassium iodide is the remedy, but it must be given to the point of toleration. The major effort, however, should be made in the very beginning of the treatment. An x-ray picture is of value in the treatment of some of these cases, but in others it is of no value.

Whenever, upon the free surface, a fungus can be attacked by the use of gentian violet, supported by the internal administration of potassium iodide, the patient will be most apt to make a recovery.

Some fungus organisms have a selectivity for certain tissues. For instance, *Endomyces vuillemini* makes its chief attack upon the epithelium, while *Monilia albicans* makes the chief attack upon the connective tissue. There are some fungus infections that will not yield to treatment and inevitably cause death. As far as present knowledge is concerned, it is possible for fungus yeastlike organisms to remain in the mouth, operating on the free surface of the mucous membrane for years and years and resisting every form of treatment. Many of the fungus organisms, if allowed enough time to operate upon the tissue, cause malignancy.

Ludwig's angina can be greatly minimized, if the diagnosis is definite, by the administration of sulfanilamide. If it does not entirely cure the disease, it will confine the infection to a smaller area, which can be more easily drained.

Commercial National Bank Building.

GINGIVECTOMY OR FLAP OPERATION?

By Balint Orban, M.D., D.D.S., Chicago, Ill.

WHATEVER the method employed may be, the ultimate aim in treatment of a pyorrhea pocket is to eliminate the pocket. This may be accomplished successfully in a number of ways. The most conservative method consists of a thorough scaling of all calculus deposits from the surfaces of the teeth to the bottom of the gingival pockets, the application of mildly astringent drugs and hygienic and mechanical home care on the part of the patient. Certainly, a large percentage of cases of so-called pyorrhea can be cured by this method if it is properly carried out.

If the gingival pockets are deep and do not yield readily to treatment, so-called gum resection or gingivectomy, that is, the surgical removal of the free margin of the gum to the bottom of the gingival pocket, may be performed. It may be done in different ways: by cutting with knives and scissors, electrocoagulation or the use of thermocautery or short waves or chemical cauterization. The method employed depends on the operator. I prefer to remove the gum by the surgical method with knives and scissors, and, in the course of this discussion, I shall give the procedure for this method. However, I do not claim that this is the only means to successful treatment. In certain cases, and under certain conditions, I do use the cautery, or other means, and in the end the results are similar. There is only one important fact which we should bear in mind: in removing the free gum margin, we must be sure to remove the entire gum to the bottom of the pocket—no more, no less. To make this point clear, I shall describe a few tissue sections so that there shall be no misunderstanding regarding the structures involved. I have frequently read and heard statements regarding this type of treatment which I am confident are based on a lack of knowledge of the morphology and physiology of the investing structures of the teeth. Intelligent treatment must be based on this knowledge. We must understand what tissues form the pocket; where the bottom of the pocket is; what the nature of the attachment of the gum to the tooth (the so-called epithelial attachment) is, and what tissues are found between the bottom of the pocket and the bony alveolar margin. Also, comprehension of the relationship between the pocket and the alveolar bone, and the condition of the bone in the case of pyorrhea,[1] is of great importance.

The pocket is formed by the surface of the tooth on one side and, on the other, by the free margin of the gum, which is covered by stratified squamous epithelium. (Fig. 1.) The bottom of the pocket is at the point where the epithelium is attached to the surface of the tooth. This may be on the enamel in young persons or on the cementum in older people. The epithelial attachment extends from the bottom of the pocket toward the root. This attachment extends like a cuff or belt

From the Northwestern University Dental School.

Read before the Section on Periodontia at the Seventy-Fifth Midwinter Meeting of the Chicago Dental Society, February 15, 1939.

1. Gottlieb, Bernhard, and Orban, Balint: Biology and Pathology of Tooth and Supporting Mechanism. Translated by M. Diamond. New York: Macmillan Co., 1938.

in varying depths along the surface of the tooth. In young persons, where the bottom of the pocket is on the enamel, the end of this attachment is at the cemento-enamel junction. (Fig. 1.) Later, the end of the epithelial attachment starts to migrate along the surface of the cementum so that, at some time, the bottom of the pocket may be on the enamel, but the end of the attachment may have receded to the cementum. (Fig. 2.) Ultimately,

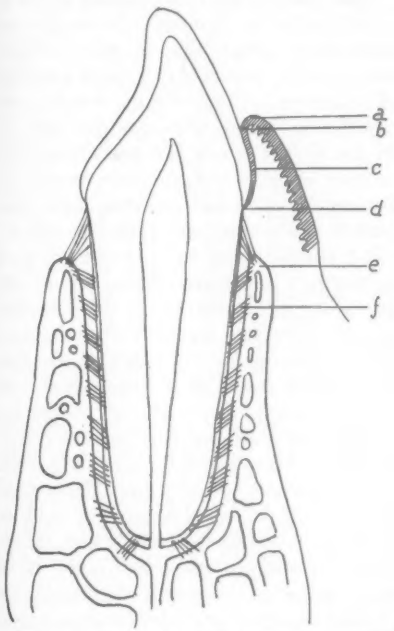

Fig. 1.—Epithelial attachment on enamel of young persons. a, free margin of gum. b, bottom of gingival pocket or crevice. c, epithelial attachment to enamel. d, cemento-enamel junction—end of the epithelial attachment. e, margin of alveolar bone. f, peridental membrane.

the entire attachment migrates to the cementum, so that the bottom of the pocket is also at the cementum, and thus a part of the surface of the root is exposed. (Fig. 3.) This is considered a physiologic process if it takes place gradually with advancing age. This process we designate as the continuous physiologic passive eruption of the teeth. If some disturbance occurs in the normal physiologic process, pathologic conditions invariably result. We should understand that, below the bottom of the pocket, there is always an epithelial attachment, extending apically from the pocket. The alveolar margin in young persons is about 1 to 2 mm. from the cemento-enamel junction. At the same time, the distance from the alveolar margin to the bottom of the pocket may range from 3 mm. up, depending on the length of the epithelial attachment. Likewise, as the epithelial attachment migrates along the surface of the cementum, the bony crest of the alveolus becomes shorter and shorter and gradually becomes resorbed.

If there is any inflammation of the gum, as is so often the case, especially in pyorrhea, the bony crest is irregularly resorbed and may be farther away from the bottom of the pocket than under normal conditions. This relationship between bone and pocket is important because some operators seem to believe that, in pyorrhea, some bone becomes exposed and that it is necrotic or infected, and in gingivectomy it therefore must be removed. If the gingivectomy is properly performed, that is, if the free margin of the gum is removed to the bottom of the pocket, no bone can be exposed. In pyorrhea (Fig. 4), the bone is never necrotic. It may be rarefied and irregular, but not necrotic. Neither is it infected. There are some cases in which the bottom of the gingival crevice reaches below the bony margin. This is especially true where the bone is very thick, as on the palatal side of the upper teeth, or buccally from the lower last molars, and where one tooth is normal while its neighbor is diseased. These cases are, however, rare, and seldom play an important part in operative procedure, because, in cases of this type, it is generally advisable to extract the tooth rather than to treat the gum.

All these histopathologic facts about the gingival crevice, epithelial attachment and alveolar margin must be thoroughly understood and kept in mind in treating conditions which are considered pathologic in the relationship of these structures. The misunderstanding of these facts has fostered therapeutic methods which should not be employed. This is especially true of the radical flap operation.

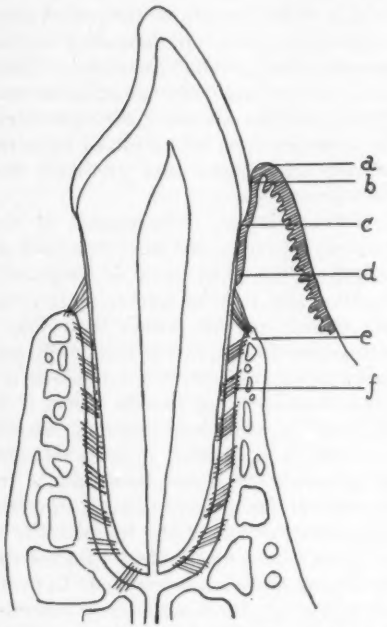

Fig. 2.—Beginning epithelial migration along surface of the cementum. a, free margin of gum, b, bottom of gingival pocket or crevice, c, cemento-enamel junction, d, epithelial attachment to cementum. (The epithelial attachment extends from b to d, and thus is fixed partly to the enamel and partly to the cementum.) e, margin of alveolar bone. f, peridental membrane.

I do not claim that all flap operations should be condemned. A flap operation may be useful under certain conditions when carried out properly, especially in the case of a sinus from a deep pocket. On the basis of histopathologic experience, as well as practical observation, I wish to say a word against the radical type of flap operation wherein the entire granulation tissue between the bottom of the pocket and the bony margin is scraped out and the bone is trimmed as far as it yields to the varying strength of force or the instrument used. We must understand what granulation tissue is; what happens if it is left in its place, and why we should not remove it and the bony process.

The granulation tissue in and below a pyorrhea pocket consists of chronic inflammatory tissue; that is, lymphocytes, plasma cells, polyblasts, a large number of capillaries and fibroblasts. Leukocytes usually are found only near the surface. In the deeper layers, we find them only in cases of acute inflammatory reactions. Sometimes epithelial processes from the pocket epithelium, or epithelial attachment, penetrate the connective tissue and form a part of the granulation tissue; but this is not very extensive. An epithelial growth never does reach the alveolar margin, and we need not be alarmed over this granulation tissue, as it merely indicates a tissue reaction to irritation. Gum inflammation is a tissue reaction to local irritation, such as tartar formation, and the action of bacterial toxins from the bottom of the pockets, local traumatic injuries from coarse food, food impaction, ill-fitting restorations, etc. On removal of these irritating conditions, disappearance of the reactive granulation tissue and healing of the epithelial covering of the gum margin can be expected.

In flap operations, when the alveolar border is exposed, we can often see that the alveolar margin, as compared with deeper layers of the bone, has a red appearance, which is often considered to be due to the presence of infection. This, however, is not the case. The difference in color may be due to the fact that the fatty marrow, which normally fills the marrow spaces of the bone, changes, from inflammatory and toxic influences, into fibrous marrow, which is red. There is

no reason to remove this bone, as it is not infected, and the fibrous marrow will be changed to fatty marrow again when the infection and inflammation subside.

I hope that I have made myself clear. There is, I believe, no good reason for removing any tissues below the bottom of the gingival crevice. If the pyorrhea is not far advanced, and not much bone has been lost through inflammation, little bone regeneration can be expected after

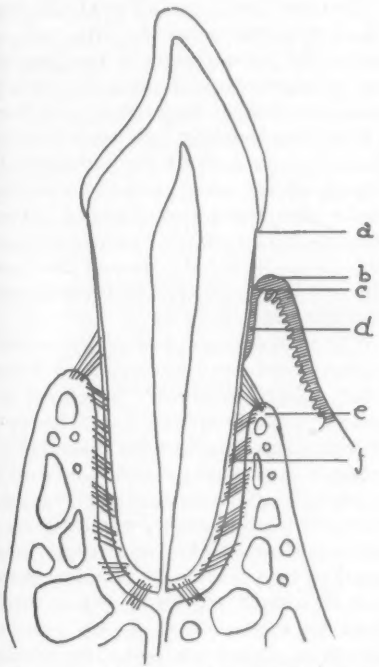

Fig. 3.—Epithelium entirely attached to cementum. a, cemento-enamel junction. (In this stage, it is exposed.) b, free margin of gum. c, bottom of gingival pocket. The surface of the cementum is exposed from a to c. d, epithelial attachment. e, margin of alveolar bone. f, peridental membrane.

treatment. Scraping out all the granulation tissue after gingivectomy may in these cases result in faster healing. The postoperative treatment will be easier and it will not be necessary to see the patient so frequently; but even if all granulation tissue is removed, no bone need be, nor should it be, removed. In advanced cases of gum disturbances, I should avoid this thorough scraping away of granulation tissue.

If the crevices are shallow and the gum is swollen, it is usually not necessary to remove any tissue, as the gum margin will shrink by itself after hygienic conditions are established and the proper home care is introduced. If the crevices are deeper, the free margin should be removed above the bottom of the pocket; and I should like to emphasize the importance of removing the tissues completely to the bottom of the pocket. We cannot compromise in this. If we have decided to carry out a gingivectomy, we should remove the tissues to the bottom of the pocket. I have often heard the question, What shall we do if the pocket is so deep that it reaches the apex? My answer is, Remove the gum to the apex. However, it is not always possible to save a tooth when the pocket is so deep. If, when the pocket extends to the apex, we were to remove only half of the gum forming the pocket, we would be giving poor service to the patient. The inflammation would continue because of the irritation and infection in the remaining pocket and the result would be unsatisfactory. I have also heard the question, What about the appearance, if we remove the gum high up on the labial surface of the root of an upper incisor or cuspid? Of course, it will not look well, but the question is whether esthetic considerations are more important than a healthy gum. Sometimes, for purely esthetic reasons, the tooth should be extracted and replaced with bridgework. These are all questions which do not change our method of carrying gingivectomy to the bottom of the pocket. Other methods, such as electrocoagulation, flap operation or even the most conservative procedures, will not produce any better esthetic results if the pockets are completely eliminated. The

gum must shrink to the bottom of the pocket or the pocket will remain. Several investigators and clinicians advocate the use of sodium sulfide to eliminate the epithelium of the pocket, and also curettement of the wall of the pocket, in an attempt to establish a reattachment of the connective tissue to the surface of the tooth, and they claim to have had some good results with this treatment. Personally, I have not succeeded.

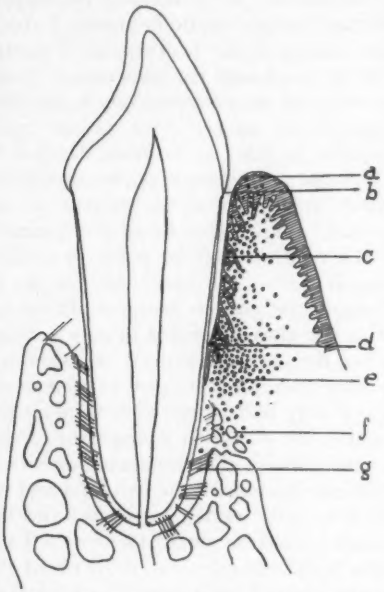

Fig. 4.—Diagram of deep pyorrhea pocket. a, free margin of gum—swollen on account of inflammatory reaction. b, cemento-enamel junction. c, epithelium lining pocket side of free gum. This tissue is thinned out and is invaded by leukocytes. d, bottom of gingival pocket. The strongest inflammatory reaction is around this area (granulation tissue). e, granulation tissue below bottom of pocket. f, alveolar margin showing resorption due to inflammatory reaction. g, peridental membrane.

Sometimes, I am asked the question, When should we perform a gingivectomy and when should we pursue a more conservative treatment? My answer is, Whenever we are uncertain as to the procedure, it is the best plan to carry out scaling and to teach the patient a proper brushing technic. If we are well prepared to perform a gingivectomy, we should not hesitate to do it, as it never does any harm to remove the free unattached gum margin when it is inflamed. The result will be the same as with the conservative treatment, but the conservative treatment may take considerably more time.

What is the proper treatment in gingivectomy?

First, the tartar and all local irritating causes should be removed, as this helps to reduce the inflammation of the gum tissue. It also helps in the gum resection to have a clear field of operation, and there will be less bleeding and faster healing. Of course, we do not have to remove absolutely all the tartar, as we can do that better after the gum has healed. However, we should remove as much as is possible in one or two sittings and then wait one or two days before proceeding with the operation.

The gum resection is done under infiltration, conductive anesthesia or sometimes topical anesthesia, the choice depending on the local conditions. The depth of the pockets should be determined by an explorer as shown in Figure 5, and their depth marked on the outside of the gum for every tooth where the gingivectomy is to be performed. We must explore the depth of the pocket in the proximal spaces and all around the teeth. When this is done, we remove the gum with a pair of scissors or knives. I prefer the scissors shown in Figure 6 and the knives shown in Figure 7. The knives as shown have a double angle, and the fine blades are sharp on both sides, permitting access to any part of the mouth. They should be kept very sharp.

After the gum is removed, the bleeding can be controlled by cotton or gauze impregnated with epinephrine. Small pieces can be packed between the teeth and the gum margin. In a few minutes, this gauze can be removed and a 10 per

cent zinc chloride solution be applied with small pieces of gauze. The bleeding will stop shortly and the wound can be covered with a surgical pack. Most operators prefer to use a zinc oxide-resin-eugenol paste, and there are different makes on the market. These zinc oxide pastes are very useful, especially immediately after the operation. They prevent postoperative bleeding, which may sometimes occur. I am not in favor of keeping these packs in place for a week or more.

My procedure would be as follows: Immediately after gum resection, the bleeding should be stopped with epinephrine gauze and zinc chloride solution. Then a zinc oxide-resin-eugenol pack should be applied. The pack should be in place not longer than two days and then the wound should be inspected. Any blood clots or necrotic tissue parts which are covering the wound should be removed and then an astringent solution should be used, such as 10 per cent zinc chloride, 10 per cent trichloracetic acid or silver nitrate. I prefer the concentrated silver nitrate whenever it can be used without danger of discoloring the teeth. It should be applied with the instrument shown in Figure 8, which has a small loop on each end. By heating the instrument in a flame and dipping it into silver nitrate crystals, some of the crystals can be made to cling to the instrument. Then the instrument is held in the flame again until the silver nitrate melts into the loop. After it has cooled, the silver nitrate can be applied to the cut surface of the gum and well localized. Its action is to form a silver protein precipitate on the surface. It does not penetrate and is entirely localized on the surface. After this treatment, the wound should again be covered with a pack. I prefer as a surgical dressing paraffin similar to that used and advocated by W. F. Dunlop. However, we do not need a medicated paraffin; just plain paraffin with a melting point of 50° C. will do. Any medicaments incorporated in paraffin cannot have any therapeutic effects, as no fluid can enter the paraffin and therefore medicaments cannot act.

The paraffin is prepared in sticks which fit a special syringe. (Fig. 9.) It is easily administered with this syringe when softened in warm water. The paraffin sticks can also be applied with finger pressure. This, however, is not so satisfactory as when it is applied with the syringe. The paraffin should be removed the next day and the mouth cleaned of soft deposits by spraying. Any calculus appearing is easily removed, as it is exposed to the surface.

Fig. 5.—Explorer to determine depth of gingival pocket and to detect roughness of tooth surface (calculus).

There are many instruments on the market for removing the tartar, all of which more or less serve the purpose. As one accustoms himself to certain instruments, they seem to serve their purpose better.

Each day, more and more surfaces can be cleaned and well polished. Any one of the astringents, zinc chloride, trichloracetic acid or silver nitrate, should be used again in the same manner as described. One should observe the appearance of the cut gum surface, and if the surface is granulating badly, a more concentrated drug should be applied; but if the granulation is only slight, a milder drug can be used. The granulating surface appears as a dark velvet tissue, elevating the surface, which turns white when the drugs mentioned above are applied. This is especially true with silver nitrate, but its precip-

itate can easily be removed the following day by lifting a thin membrane, as it is only superficial. If zinc chloride or trichloracetic acid is used, the membrane does not separate so easily, as its action is somewhat more penetrating. For this reason, I prefer the silver nitrate and use the other two drugs only when I wish to avoid any discoloration. However, the silver nitrate discoloration can usually be removed by the use of pumice on the rubber cup employed in the dental engine, and polishing strips. It may show up particularly at the cemento-enamel junction or on the margin of fillings. The use of the paraffin is continued after the application of the drug, and, in about eight to fourteen days, the gum will heal. The healing process may depend on the individual tissue reaction, one reacting quickly, another slowly. I have seldom seen cases which require as long as three weeks' attention. The histopathologic background for this postoperative treatment is as follows:

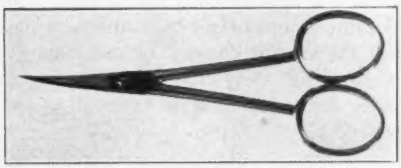

Fig. 6.—Pair of scissors for gum resection.

When the free margin of the gum is cut away to the bottom of the pocket, the inflamed connective tissue of the gum is exposed to a granulating wound. In granulating tissue, a large number of young connective tissue cells and capillaries develop, producing the red velvet surface of granulating tissue. This new granulating tissue is removed every day from the surface with drugs and, in that way, opportunity is given to the inflammatory tissues to heal as in an open wound. The healing will be accomplished in from eight days to three weeks. I am convinced that this conservative operation of gingivectomy gives the best opportunity for bone regeneration, which is eventually a very important factor in any treatment.

I prefer to remove the gum with knives and scissors instead of with electrocoagulation or cautery because of the clean-cut surfaces left by the surgical method. With coagulation or the use of the cautery, the tissue has to slough off after it becomes necrotic and separated from the healthy base by a demarcating inflammation. In surgery, we can observe the exposed gum surface and can treat it according to its need; while, in coagulation or cautery, we can see the result only after the tissue sloughs off, and it may be necessary to repeat the procedure. In cautery or coagulation, we cannot use any method to treat the inflammatory granulation such as the procedure which I have described in surgery.

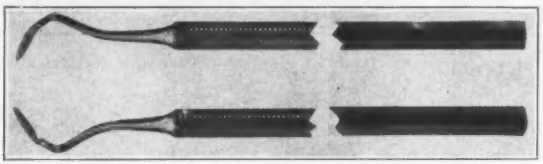

Fig. 7.—Pair of knives for gum resection. The cutting edges are sharp on both sides and permit access to any part of the mouth.

Local treatment should not be limited entirely to the gum, as adjustment of the bite is also an important factor to be considered. If the gum inflammation has destroyed large portions of the supporting structures, and the teeth have been loosened, we should consider the use of splints to eliminate the movement of the teeth. The occlusal forces should be so directed as to act mostly in the long axes

of the teeth. Elongated teeth should be ground to shorten the extra-alveolar level of the teeth. There are many other things to be considered which are not within the limits of this presentation. A very important factor is the home care by the patient, and, frequently, considerable time must be spent to teach the patient the proper procedure. If some general health disturbance is suspected, the advice of a physician who has special qualifications should be recommended, and everything should be done to improve the condition, as this will certainly have its proper effect on the local tissue reactions. Certain conditions, especially a diabetic condition, high or low basal metabolic rate, toxic goiter, ovarian disturbances, anemic conditions and nervousness, should be treated by the physician before, or at the same time as, the gum disturbance. Diet habits and digestion should be investigated, but we should not overemphasize general health treatment as we eventually depend on local treatment for our results.

Fig. 8.—Silver nitrate loop.

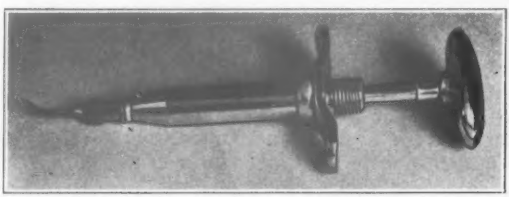

Fig. 9.—Paraffin syringe with curved nozzle. This nozzle has, on the convex side, a short extension to enable the nozzle to enter narrow spaces.

CONCLUSIONS

1. Knowledge of the histopathology of the supporting structures of the teeth is necessary in treating diseases of that region.

2. Granulation tissue below the bottom of the pocket is not a tissue to be afraid of and should not be removed surgically. It is a tissue indicating a reaction to irritation, and it will disappear if the cause is removed.

3. In pyorrhea, alveolar bone is never infected and never necrotic. Trimming the bone is only justified if the bottom of the pocket reaches below the bone margin. This is seldom the case, and when it is, it is usually advisable to remove the tooth.

4. In many cases of pyorrhea, scaling and cureting the gum to the bottom of the pocket will be satisfactory.

5. If the pockets are very deep, the best method of treatment is gingivectomy, the surgical removal of the free margin of the gum to the bottom of the pocket. The postoperative treatment consists of the use of astringent drugs (silver nitrate) to bring about the healing of the inflamed soft tissues and to give opportunity for bone regeneration.

311 East Chicago Avenue.

PROBLEMS INVOLVED IN REINFORCING UNDER PORCELAIN

By Fred R. Felcher, D.D.S., Chicago, Ill.

I SHALL here attempt to discuss the problems of reinforcing porcelain with a view to analysis of the methods used, and then offer a technic which, I believe, comes close to meeting the requirements of dental practice and procedure.

What do we mean by reinforcing under porcelain? We have always understood that whenever metal is placed in porcelain or in any refractive material, there is a greater tendency to fracture than if the material were used intact. Thousands of all-porcelain jackets are serving a useful purpose without breakage. Let us study the background of the idea to see whether there is justification for the use of reinforcing materials under porcelain.

Reinforcing under porcelain is not new. The idea of using platinum or platinum metals, perforated sheeting, bars, etc., originated many years ago. The platinum pin and coping crown that had a facing soldered to the pin and which was subsequently finished by baking porcelain to final contour was a reinforced crown. The same type of attachment with a bar soldered to it and another abutment, the facing soldered to the bar and filled in finally with porcelain, was a reinforced bridge. Another type of reinforced prosthesis is really the continuous gum denture in which porcelain is baked to the platinum and the teeth.

It seems that when opaque porcelain came into use (and that material is also not new), the idea that opaque porcelain might be used because it would hide metal is possibly responsible for the development of reinforced bridges.

The types of reinforcements used are many. It is apropos to discuss here some of the different types. One of those most extensively used for a while was the "torque resistant bridge." Its design consists of two iridioplatinum sheets soldered together, to which may be added some kind of bar, "T," "Y," "L," etc.; this frame work covered with opaque porcelain, and this, in turn, covered with porcelain. There have been many changes in this technic, the original consisting of the application of a sheet of iridioplatinum 5 per cent, gage 0.0035, to the present laminated type, just described.

When we first started with work on opaque reinforcements (1932-1933), we obtained as many materials as possible that could be used under porcelain. From one of the manufacturers of platinum materials, we purchased platinum screen mesh, or a perforated platinum sheet and iridioplatinum sheet, solders, etc. Some interesting things were discovered, many of which I have mentioned in papers and articles published from time to time.

There is no union between platinum and porcelain. Those who doubt this statement are reminded of how easy it is to peel platinum from an inlay or

Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 26, 1938.

jacket crown. For those who think that the coefficient of expansion and contraction is the same for platinum and porcelain, I wish to state that not only is there a difference in the coefficient between the two, but there is even a difference between porcelains. For example, when we build a jacket crown over a matrix of platinum foil (0.001), the foil tends to warp under the contraction of the porcelain during the firing. If we attempt to make a large tooth, a large molar for instance, unless we "ditch" properly, the warpage is so great as to prevent the crown from fitting the die. If a heavy gage of the same kind of platinum is used where the porcelain cannot warp the platinum, the porcelain will check or crack. In both instances, the porcelain will not adhere to the metal.

Perforated iridioplatinum is used more with the idea of giving the porcelain an opportunity to hold. Of course, all things being equal, there is little to be gained except that there would probably be a weaker support by virtue of the perforations than if solid sheet were used.

Next we come to the use of mesh. This is a platinum mesh of different gage holes. In the original experiments, as with the perforated sheet, the mesh or screen was soldered to the iridioplatinum sheet, for attachment purposes, but that did not help. Another idea was to hide the mesh in opaque porcelain and cover this in turn with dental porcelain, but the crowns were no stronger.

Another idea is to use iridioplatinum shells similar to the gold shells used to make crowns. These are swaged and fitted to the dies. We are told that patents have even been applied for for some of these ideas, although the ideas are not new.

Let us now confine ourselves to the question in the first part of the paper as to what reinforcing under porcelain means or should mean.

The tooth, of course, is covered with enamel, but the enamel is supported by dentin. Thus, when forces are applied to the enamel, the stresses are absorbed by the dentin and, in turn, the tooth moves in the socket, cushioning the force. Enamel only breaks out when it is unsupported, as in decay. When we place a porcelain jacket crown on a tooth, as long as the tooth has sufficient structure after preparation to support the porcelain, the jacket stays in place and affords ideal service. If, however, we have a tooth that is broken down, and stresses are thrown through the porcelain, we have a "half moon" fracture, or a "vertical" fracture, the type being dependent on the character of the forces which cause the break.

It seems that the advocates of the reinforced technic did not take this condition into account, for, in all of the technics, the sheet of metal covers the stump, and this stump is lengthened only by the thickness of the metal. Hence, we might have a lengthening of, let us say, 0.0035 where we might need many times that amount.

In bridges where sound teeth are prepared for reinforced jackets, many cases are successful because there is sound tooth support, but when teeth that were broken down have to be taken care of, it is a different story.

Let us now consider bars, for they have much to do with reinforcement, or lack of reinforcement, in many cases. The early flat bar was soon changed for an "I" bar, and then other types. The larger the bar, the easier the fracture; for enough porcelain cannot be put over the bar for esthetic reasons. All teeth have to be made of the square type, certainly something not in accord with esthetics of porcelain. As failures of many of these bridges called for a remedy, some of the laboratories have been using what is called a "unit bridge."

In the July 1921 issue of *The Dental Cosmos*, I described what was the fore-

runner of the "thimble" and the present so-called "unit bridge." Harry W. Hamilton and I spent some time in 1917 and 1918 making cores to prevent breakage of jacket crowns where teeth were broken down. We succeeded so well that we decided to leave the sprues and unite these sprues by solder. Then we made castings resembling tooth preparations to fit over these sprues, which we later called arms. Over these castings, we made jacket crowns, the abutments having one slot or opening and the dummies having two slots.

Several years later, one of the laboratories advertised the "thimble" bridge, and now we have the "unit" bridge, which is the same bridge. In spite of the fact that we suggested this type of bridge about twenty years ago, we do not use it; for all of the teeth must be made of the square type unless metal is deliberately shown at the interproximal-gingival surface, and too much tooth is destroyed. The replaceability feature is not so important, for, aside from accident, when a tooth breaks, it will break again and again under the same conditions unless the foundation is changed, and in these cases it means remaking the bridge. Secondly, too much tooth structure is removed to allow for the thickness of gold and porcelain on the thimbles. Thirdly, the time involved is quite long; for it is necessary, after the castings are made and the bridge is assembled, to make separate impressions and dies for the construction of the porcelain.

The picture so far painted is not a rosy one. I shall now, however, approach the problem from another angle. Jacket crown breakage is due to directional forces passing through porcelain before the tooth can react to cushion the shock. This is a condition that we should be able to overcome in reinforced work, and I shall show later in this paper how it can be done. Two additional factors, and important ones, must be considered; namely, esthetics, and, most important of all, tooth conservation.

Reinforcing porcelain should mean that a metal support is placed under the porcelain, which, in itself, is hard and strong enough to repel all stresses. The porcelain should have little or nothing to do with the strength of the bridge, and adhesion must be obtained between metal and porcelain. We must admit that this is difficult, for the more metal we use, the more we must compensate for possible strains or checks in the porcelain.

In our experiments, we developed certain ceramic bodies and certain platinum metal combinations in harmony with each other that enabled us to get what is known in ceramic industry as a chemical or mechanical bond between the metals and a grip coat.

A NEWER METHOD OF REINFORCING UNDER PORCELAIN

I shall first discuss the single restoration, which I call the reinforced porcelain jacket crown. As stated before, if there is enough tooth structure present under the jacket, there is no need for reinforcing. If, however, we find a stump or a cone, or the mesial or distal portion of the tooth is missing, we must have some method for replacing the lost structure so that stresses will be eliminated through the porcelain.

A jacket crown is attached to the tooth by cement. Cement has few actual adhesive qualities when used on porcelain. The retention seems to be more an expansion of the cement, a sort of wedging, and if we can at least obtain the same kind of adhesion by a metal porcelain combination as is obtained by cementation, we should consider it a safe procedure. It does happen, however, that the attachment is greater, which is an advantage.

The shoulder also should receive some consideration. Teeth prepared properly

for porcelain jacket crowns always have a shoulder, and this is accepted as general. However, the question is how much, if any, strength is obtained by the use of the shoulder. The answer properly will be, none. The shoulder has nothing to do with the strength of a jacket crown. Shoulderless porcelain jacket crowns where the porcelain is protected do not break, while shoulder preparations where short stumps are allowed under the porcelain do break. We do not have shoulders in the dentin for enamel. The shoulder rightfully is a finishing off place for the porcelain, really a butt-joint. For every preparation with a perfect shoulder, many preparations have some shoulder attempts in part of the preparation. This is because of the difficulty in some cases of preparing the shoulder, the fear of destroying too much of the tooth in order to allow for the shoulder in some preparations.

If we are obliged to cut into a tooth for more than what is required for an ordinary jacket crown, as is required in some reinforcing technics, we find ourselves with a double hazard, that of making a shoulder in the first place, and too great tooth destruction. In the new technic, we eliminate the use of the shoulder entirely in posterior teeth, using the finish line principle of adapting metal snugly to the teeth, and then making a shoulder in the metal for the porcelain. In anterior teeth, we use a labial shoulder, and, for some cases, we use a complete shoulderless preparation with a fine line finish at the labial surface. This is important in jacketing lower anterior teeth.

When we deal with broken down areas, we of course use the metal build up for restoration of the lost areas. This, of course, gives us a chance to obtain a stronger jacket crown. Suppose we combine a partly shoulderless jacket crown finish line and, at the same time, restore the lost portion of the tooth: we would not only expect to obtain a stronger jacket, but also to avoid destroying too much tooth structure, and if the adhesion of metal to porcelain is somewhat better than is obtained with cement, we should expect success, particularly if the metal has strength sufficient in itself.

This is the basis of the technic. The metal is quite hard, and when it contacts tissue, as for a finish line, there is a tissue tolerance due to the density of the metal and the manner in which it is handled. No plaques form on this metal, something that is not true of cast gold. It can be burnished and adapted easily. When we make reinforced bridges with this technic, we believe that there is greater advantage than is afforded by other methods, for here the flexibility of the technic allows for stronger abutments. It is to the abutments that we must pay attention, seeking for strength and paying less attention to fancy bars. When we construct the ordinary all-porcelain wing bridge, a jacket crown and a dummy, or when we construct an all-porcelain bridge of two abutments, and these bridges fail, it is always the abutment that breaks, because the forces are distributed to the abutments. No bridge is stronger than the abutments that support it.

It is therefore necessary that the abutment adapters be not of one type as is usual, but that the adapters be flexible in their adaptation, so that instead of the one conventional type, we may build many types.

The Band Adapter.—This is a band type used for shoulderless preparations as in lower anterior teeth, bicuspids or molars where it is not necessary to build up teeth because of lost structure. This type is built "finish line," with a shoulder in the metal. If the case is an anterior one, the labial or buccal shoulder is made narrower. In bite raising cases, the adapter is often left open at the occlusal portion so as not to interfere with the bite.

The Partly Shoulderless Adapter.—This type is usually used for esthetic effects. Only a labial or buccal shoulder is used, the shoulder being continued in the metal, with a finish-line fit below the gum and a shoulder placed in the metal.

The Adapter for Broken Down Teeth.—This type is of course what its name implies, built so as to compensate for directional forces where teeth are broken down. Short stumps are lengthened, mesial or distal angles are restored. This type of adapter may be used with shoulder, without shoulder or with partial shoulders.

The Open Window Adapter.—This type is used where the teeth are somewhat out of line. A shoulder is used on the labial aspect, being made a little deeper so as to reinforce the adapter there, and then a window is cut at the labial-incisal portion. The finished jacket crown does not extend too much out of line.

The Close Bite Adapter.—Used with a finish line at the lingual aspect, allowing removal of less tooth structure, the metal is brought down to the gingival third on the lingual aspect, the teeth closing on metal instead of porcelain.

Other adapters may be made according to conditions, as, for instance, the inlay adapter for three-quarter cases or for pin inlays, and we also have a type of adapter which is used in connection with precision attachments.

Each of these adapters is available for single crowns or for bridge abutments, and, in the latter, additional reinforcement along the lingual and proximal portions tends to prevent pull mesiodistally. Also, especially in wing bridges, there may be a slight grooving proximally, if desired, which prevents torque stress.

RÉSUMÉ

The minimum metal consistent with the case should be used.

Bars should be as small as possible.

The greater the amount of metal used, the greater the necessity for compensating opaque porcelains.

No soldering or soldering with pure platinums gives advantage

The use of solder usually causes gases or prevents adaptation.

Screen, or a mesh perforated sheet, or iridioplatinum caps as sheets, whether single or double, do not tend to prevent directional forces where teeth are broken down. Metal-porcelain affinity is not usually present.

To attempt to make a finish line by the use of ordinary metals where a wire is bent and soldered either with solder or with platinum is not advisable, for reasons just mentioned, and also because it is usually difficult to bring the width of the exposed metal as high as is sometimes required.

No preparation should take from the tooth more than is required for a regular porcelain jacket crown. Any contrary technic is dangerous to teeth.

Unless esthetic values of the highest degree are obtainable with porcelain, the purpose of its use is defeated. Whether a square, tapering or ovoid tooth is needed, the technic should allow for construction of the needed type.

No bridge is stronger than its abutments. The abutments should therefore be strong without tooth destruction to allow for metal. In our technic, we introduce metal lingually in the mouth for strength. It does not show and, because of the tissue tolerance of the metal, no irritation is found; yet there is strength.

Because of the nature of platinum metals, and the ease of contamination, the proper investments should be used. Ordinary soldering investments such as are used for gold should be avoided. The investments must be free of anything deleterious to platinum metals, silica, carbon, etc.

25 East Washington Street.

WAYS AND MEANS OF AVOIDING OBVIOUS ARTIFICIALITY

By Irving R. Hardy, D.M.D., New York City

I AM beginning this paper with an assertion which I think will not be successfully contradicted: The denture which will fool all of the people all of the time has not yet been constructed. Of course, if you are gullible enough to believe all the advertising sponsored by manufacturers of teeth and denture base materials, you might assume it to be a simple matter to assemble these materials in such a way as to deceive even the most critical. I am very sure that many members of our profession must swallow these blurbs, hook, line and sinker, but the discerning general public is not so easily taken in.

I quote from a best-seller of the moment, a book entitled "With Malice Toward Some," by Margaret Halsey. Commenting on the appearance of artificial teeth, this observing writer says, "But one curious point remains unexplained—why are the false teeth so amateurish? They all look as if they had been filched from the Etruscan Room of a museum." Mrs. Halsey's criticism is on the whole a bit harsh, but you must realize that she is speaking of English dentures, and we all know that American dentists are so superior in their professional efforts that no such charge could be brought against them! However, you could very easily indict a majority of the dentures constructed this year by our own contemporaries on the charge of obvious artificiality.

Not long ago, I visited a town where I once lived, and I met several people whom I used to know very well; in fact they were my patients when I lived in that vicinity. Assuming that I would be, and I was, still interested in their dental problems, they all and severally told me of their newly acquired appliances, but they need not have uttered a word in explanation, for the teeth spoke for themselves. They did more than speak, *they shouted;* and they could not have broadcast their artificiality more effectively if they had been wired for sound. I shall not attempt to enumerate their deficiencies; they could all be included under one description, a rather deadly monotony. They were monotonous in tooth arrangement, monotonous in color and monotonous in tooth form; in other words, they lacked individuality.

Once in a while, I succeed in building a denture which comes at least fairly close to satisfying my esthetic sense. These dentures are most often the "immediate denture" type. In such cases, each artificial tooth is, as nearly as I can make it, an exact replica of the natural tooth it replaces. It also occupies in the arch the exact position formerly occupied by the natural tooth. I often have to resist an impulse to straighten things out a little by moving a malposed tooth more nearly into line. Sometimes I am persuaded by my patient into correcting an irregularity; but while I seem to acquiesce, I always try to only half correct it so that the effect is still there,

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even though somewhat lessened. When the denture is finished, having copied Nature faithfully, even to the extent of perpetuating some of her mistakes, I have a denture which has individuality, and, what is more, the individuality of the person who wears it.

Many patients, however, present themselves for treatment in an edentulous state and so no opportunity for copying Nature's dentition is provided. Here it is necessary to fall back on that rather nebulous factor, past experience. The tooth type may be selected from the face form. I generally start with that premise, though I often modify it greatly. It is as good a starting point as any.

I have learned to avoid molds with flat labial surfaces. There has been a distinct tendency among tooth manufacturers toward these flat-surfaced molds. Flat labial surfaces tend to reflect light in such a way as to attract undue attention. I know that we see in Nature some teeth with flat labial surfaces, but natural teeth and artificial teeth are very different in light absorbing and light reflecting properties, and I advise shunning a flat-surfaced tooth as one would a plague.

Most artificial teeth are too small. The use of small teeth is probably largely due to inertia, for sometimes the use of a tooth of proper dimensions necessitates some grinding of the ridge lap to place it properly in position. Small teeth need no grinding, so small teeth are used. Their obvious artificiality stems largely from the fact that the cuspids are too near the median line. This narrowing of the intercuspid width throws the bicuspids into undue prominence, and the general effect is of a mouth full of teeth. So I am sure to select teeth large enough. They can always be "whittled" down during the setting-up process.

Nearly all the dentures that I make are for people in middle life or later than middle years. Try to recall how many people in their later years you know who have their natural teeth in perfect alinement and have also no evidence of porcelain or metal fillings, no erosion, no abrasions and no retraction of gingival tissue. Few, if any, are blest with perfect dentition. On the other hand, in our so-called civilized existence, the older person who has his natural teeth in symmetrical arrangement and in otherwise perfect condition is a distinct rarity. The lay public, and it is the one I am endeavoring to mislead into the belief that the teeth I have inserted in any specific case are of Nature's creating, accept as the middle-aged dental norm something short of perfection. This is indeed fortunate for the dentist; for it is possible to create artificial teeth which reproduce with at least a fair degree of fidelity the actual condition of most middle-aged mouths. It is extremely difficult—yes, nearly impossible—to make artificial teeth which will successfully imitate a perfect dentition.

There has recently been introduced to the profession an anterior tooth with a translucent tip. This is quite an advance in tooth manufacture, but it does not solve our problem of dental esthetics as nearly as I thought it would. Two years ago, I saw a full upper and lower denture which was constructed by one of our members for a man of about 60 years. The teeth were shade twenty-one or thereabouts and their incisal edges were artistically ground; in fact, they harmonized with the patient's complexion and general physical characteristics. A few months ago, I saw the patient again. He now has new dentures which fit beautifully; the lower in particular was so well adapted that it adhered perfectly and this on a most unfavorable ridge. But the translucent tip teeth which were used did not look at all right. Their translucency gave them a distinct grayish cast which was not in harmony with the "sere and yellow leaf" shading of

the patient's complexion. These translucent tips I have found invaluable in making partial dentures for young people, but that is another story. There are two conditions which tend to destroy incisal translucency in natural teeth: (1) wearing away of the incisal edge, removing the thin incisal enamel which is responsible for the translucency, and (2) the invasion of the dentin between the enamel plates by stain from mouth fluids saturated with food, drink and tobacco. As these stains permeate the incisal dentin, they block off much of the light which might filter through the enamel, and so destroy translucency. Therefore, to obtain the most effective appearance from the translucent tip tooth, we must grind off a considerable amount of its translucent area when employing it in a middle-aged mouth. In this way, the too gray appearance that it will otherwise present is easily and effectively avoided.

The building of individuality in the teeth consists of a not at all difficult process of grinding into them certain distinctive anatomic deviations from perfect symmetry. Incisal edges are ground to simulate abrasion; labial surfaces are altered to imitate erosion at the neck, and any anatomic deviation is made that the operator deems it wise to incorporate. If porcelain fillings are to be imitated, such fillings are ground in by circumscribing the area of the filling with a slight ditch. Cavities for gold inlays are also cut with stones and disks. Mesio-incisal or disto-incisal fillings on the whole afford more realistic effects than do the proximal type. All this grinding is slightly exaggerated, for alterations which are too subtly introduced tend to completely disappear when the teeth are in the mouth.

After all the grinding is accomplished and the teeth are suitably arranged on the trial base, checked in the mouth and approved, further individuality is given them by tinting and coloring with mineral stains. I cannot describe the application of the stain in detail, but there is one point in technic which I wish to emphasize: the importance of a rather heavy coat of glaze over the previously fired stains. Such an overglaze gives the underlying colors qualities such as apparent depth, greater diffusion and a good imitation of the natural tooth. Surface staining generally looks like what it is, a splotch of color rather unrelated to its background. In general, the precautionary advice offered about avoidance of too great subtlety holds for coloring as it does for grinding. Color changes which appear drastic when the tooth is held in the hand are greatly minimized when the tooth is in the mouth.

I do not see how we can expect manufacturers of teeth to supply us stock molds which will fit every case. Do not misunderstand me: I wish to obtain from the makers the best possible product—I do not want them to rest on their laurels and assume that they have achieved all there is to be done; but I also think that the manufacturer of teeth has reason to expect the user of his product not to be totally devoid of technical skill and creative imagination. Dental prosthesis is, as far as its esthetic problems are concerned, not so easily reduced to a formula as are the more mechanical procedures. The rules are not very clear. It is a kind of anarchistic, or at least a rugged individualist's, field, where there is ample room for self expression.

9 Rockefeller Plaza.

SWELLING OF THE FACE, JAWS AND NECK

By George J. Fink,* D.M.D., M.S.D., F.I.C.A., Boston, Mass.

SWELLING of the face, jaws and neck which is commonly met with in dental practice gives rise to much concern, not only to the patient, but to the operator as well. The causes are manifold and the treatment, based on individual diagnostic skill, has a wide enough range to warrant an examination of our knowledge in this regard.

Swelling of the face, jaws and neck may be either acute or chronic, the result of trauma or infection, or both, or may indicate the presence of a new growth or some systemic derangement.

The acute dento-alveolar abscess giving rise to the swelling of the jaw is the most prevalent condition met with in practice. This condition may occur before or after the removal of the offending tooth. Oftentimes, early removal of the acutely inflamed tooth will prevent such abscess formation. In consideration of the danger of spreading the infection, however, before defense barriers have been built up around the area involved, and in the absence of a complete history, it is my practice to prescribe palliative treatment for the pain, along with general treatment to aid in localizing the infection. The most frequent reason for the removal of teeth in such conditions is the attendant excruciating pain. It is my belief that the introduction of a local anesthetic is not, in itself, responsible for a cellulitis following extraction of an acutely inflamed tooth. I do believe that the trauma accompanying the infection, as well as the mechanical factor in releasing the drug in the tissues, tends further to insult tissues in the process of building local defense barriers, and, of course, surgical trauma associated with tooth removal makes an almost insuperable task for those elements warding off deeper invasion.

Where drainage can be obtained by way of the root canal, relief invariably follows. If, on the other hand, the tooth is a pulpless one with a canal filling, such measures as the use of hot intra-oral irrigations or hot extra-oral poultices, together with one fourth grain of morphine or one twentieth grain of dilaudid for pain, as well as general supportive treatment, should be prescribed. Tooth removal, in such instances, may, therefore, be considered the operation of choice.

The erupting mandibular third molar is probably next in importance as the most common factor in the hard brawny swellings of the jaw and neck. This condition may disappear after the onset without treatment of any kind, only to reappear in sufficiently severe form to prompt a visit to the dentist. Not infrequently, the dentist may "lance" the inflamed operculum overlying the tooth. If the patient gets well in spite of his treatment, such practice should be wholeheartedly discouraged. Escape from a more serious fate once, or a dozen times, does not place that procedure within the scope of good practice.

When the acute inflammation and swelling have subsided, sufficient local resistance will be built up to permit more extensive surgical measures without the danger of complication. Swelling asso-

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ciated with the usual surgical procedures in alveolotomy, root retention and flap surgery is normal to the trauma associated with such practice, and rarely, if ever, follows the course of surgical procedures performed in the presence of acutely inflamed or infectious processes.

In simple, uncomplicated fracture of the jaw, in which swelling results from violent impact, the question of removing the teeth which are in the line of fracture should be left entirely to the judgment of the operator. Oftentimes, for the purpose of maintaining satisfactory relationships between bone fragments, it is necessary to permit such potential sources of subsequent sepsis to remain. The frequency with which the organisms of Vincent's disease are seen in these cases of fracture accompanied by swelling is perhaps the strongest argument for permitting teeth in line of fracture to remain.

Infected, broken down cysts, and the dento-alveolar abscess, especially in the maxillae, are responsible for such swelling as may cause a tremendous ballooning of the mucosa of the palate and, not infrequently, the loss of the lateral nasal landmarks as well as the complete closing of the eye on the side affected. Treatment here is simple, requiring nothing further than incision and drainage.

Chronic infection of the teeth which becomes acute or surgical operations performed in the presence of acute inflammation or infection may produce a subperiosteal abscess, periostitis, osteitis or osteomyelitis, with subsequent swelling of the contiguous tissue or subjacent part. Treatment in the early stages, when effective, will cause localization or absorption of such processes.

However, whenever bone or periosteum is involved, there lies dormant the danger of more serious bone infection, osteomyelitis. Fundamentally, treatment varies little, whether the infection is local or involves the bone and the soft tissues. Swelling of the neck resulting from any of these conditions may subside or go on to cellulitis and later abscess. If the infectious process follows along the plane of the superficial fascia, a local, circumscribed area, fluctuant and exquisitely tender, will manifest itself. Here again, we resort to incision and drainage.

When the swelling involves the floor of the mouth, and there exists a bilateral cellulitis of the neck, the infection may follow along the plane of the deep fascia, causing edema of the glottis and tongue, elevating the floor of the mouth, resulting in dyspnea and cyanosis, and later asphyxia and, if the course of the infection is not arrested, death.

CONCLUSION

The importance of a conservative approach based upon thorough diagnosis is emphasized. Lack of interest or failure to approximate the seriousness of the condition is responsible for many of our grievous problems.

SUMMARY

1. Abscessed teeth are the most common cause for swelling of the face, neck and jaws.

2. Eruption of mandibular third molars, causing local inflammation, may produce swelling of the neck, cellulitis and abscesses in the presence or absence of surgical measures.

3. Fracture, osteomyelitis and broken down infected cysts are frequent causes for facial, as well as submandibular, swelling, cellulitis and abscess of the neck.

4. In the treatment of such swelling, heat both intra-orally and extra-orally, together with palliative and supportive measures, is applied.

5. The uneventful end-result is frequently based upon proper early diagnosis and adequate treatment.

6. The course of such swellings may be altered by early diagnosis and adequate treatment.

416 Marlborough Street.

PERIODONTAL DISEASE AND ELECTRO-COAGULATION

By M. D. WOLFSOHN, D.D.S., Buffalo, N. Y.

PERIODONTAL disease has been associated with mankind since the earliest records of medical literature. Many concoctions, potions and remedies have been used in its treatment during these years, with indifferent results. Astringents and mouthwashes have been prescribed. Centuries ago, teeth were tied together and extruded teeth were filed down.

In the latter part of the nineteenth century, John M. Riggs, of Hartford, Conn., first described a method of treating periodontal disease by surgery. The modern school of advocates of treating periodontoclasia by instrumentation is of comparatively recent origin. Many of the operators of this new era are still doing splendid work. Most of them early realized that it requires more than a knowledge of treatment of the periodontal pockets around a tooth to achieve successful end-results.

In studying the books and published articles of this new school on this subject, one is impressed with the necessity of acquiring a fundamental knowledge of the histology and pathology of periodontal disease as well as a thorough understanding of its etiology and diagnosis. A keen appreciation of the intricacies of occlusion is surely a requisite.

Stillman and McCall have made a great contribution to modern dentistry in their "Textbook of Clinical Periodontia." In both editions of this book, they have stressed the important part that traumatic occlusion plays in the causation of periodontal disease.

An understanding of the diagnosis and treatment of this important condition goes a long way toward the successful handling of a so-called pyorrheic tooth.

DIAGNOSIS

Many cases of periodontoclasia are treated and finally discharged with apparently good results without any attempt at diagnosis. The mere act of trying to make a diagnosis often helps the dentist to observe causative agents that would otherwise be overlooked. These factors are often fundamentally important sources of disturbance and their elimination tends to bring the case to a successful conclusion. In other words, cases that are treated without a diagnosis turn out to be complete or partial failures. Consequently, it is advisable, in handling a periodontal condition, to spend the time necessary to establish a diagnosis. Good x-ray pictures are of primary importance.

PROGNOSIS

It is also requisite that much thought be given to the prognosis of the case. This pertains to the condition of the mouth *in toto* and to each tooth to be treated.

Under this heading, I shall consider the status of the devitalized tooth. So much has been written about these pulpless teeth that there seems to be nothing new to record. However, there are certain important points to be contemplated. One is the retention of teeth having good root-canal fillings and which ap-

pear negative in the roentgenogram as to apical disease.

It is true that cultures made from a pulpless tooth with negative x-ray findings often yield *Streptococcus viridans.* It is also true that the same bacteria may often be obtained from vital teeth having deep-seated fillings and from teeth containing pulp stones. It therefore seems reasonable to retain these pulpless x-ray negative teeth with mild perio-

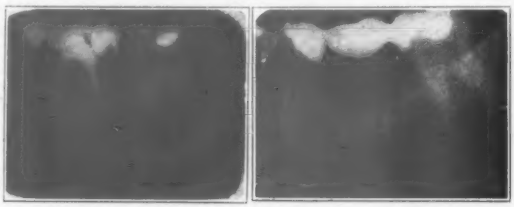
dontal conditions provided the age and general health are favorable.

The extraction of this type of tooth, as shown in Figure 1, A, necessitated a fixed bridge, as shown in B. It is highly improbable that the inlays and dummy occlusal surfaces show such harmonious articulating surfaces as did the occlusal surfaces of the natural teeth. The health of the periodontol tissues is in proportion to the normal functioning of the occlusal surfaces.

TREATMENT

The latest contribution to the treatment of periodontoclasia is electrocoagulation. Much experimental work has been performed during the past few years in the adaptation of the diathermy machine to the needs of dentistry. The greatest progress, in my opinion, was the designing of the Webb electrode. Its flexibility marks the first real improvement in the use of diathermic energy to coagulate periodontal pockets and to destroy excess and unnecessary tissue.

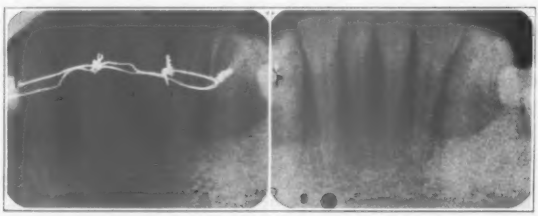
The silver points as furnished by the manufacturer can be filed to a smaller diameter, and thus be made more slender and therefore more adaptable for smaller pockets. The electrode shown in Figure



A B

Fig. 1.—A, case before extraction. B, fixed bridge inserted after extraction.

Fig. 2.—Electrodes.



A B

Fig. 3.—An apparently hopeless case treated by electro-coagulation. These teeth are firm and comfortable, and functioning normally.

2, A, can be used to reach most surfaces on all teeth, the exception being the lingual surfaces of the lower molars. For these surfaces, I use an electrode with the points placed opposite so that they can be readily inserted alongside the lingual aspect of the molar teeth. This electrode is shown in Figure 2, B.

The first step, before applying the electrode points, is the equilibration of the occlusion. This restores functional occlusion, and it is a painstaking task, playing an important part in the successful finishing of the work.

Next, all scaling is performed. The apoxemena may be removed from all or from as many teeth as are to be treated by coagulation at one time. The number to be treated at one time varies with the individual. Some patients are more sensitive than others, but the range varies from four to eight teeth at one sitting. Local and topical anesthesia can be used, but, in many cases, anesthesia is unnecessary.

A cross-section of a pus pocket shows an epithelial covering that has grown down from the crevicular surface. Thoma and Goldman have shown this condition in photomicrographs. It is necessary to remove the epithelium as well as the inflammatory tissue present in the pocket before closure can be accomplished.

My technic for treating periodontal pockets is somewhat different from the generally accepted method. The difference lies in the fact that I do not destroy the periodontium. I confine my efforts to desiccating the tissues of the periodontal pocket. The only exception is the removal of the hypertrophied marginal gingiva or tissue at the bifurcation of a tooth.

This method of using the electrocoagulation points offers an ideal procedure for attacking these tissues. No alveolar bone will be destroyed. The decalcified bone reticulum will be retained if care is exercised in the handling of these points. All pus products that are present in the cavity are destroyed. This is especially important in focal infection as it prevents a bacterial shower. These slender silver points can be made to slide into the deepest pocket in any position, with the applicator for which the situation of the tooth calls.

A shorter time application of the points under higher power is recommended rather than the use of a longer placement under lower power. This makes for a less painful operation, especially where a local anesthetic is not used. The electrode points are bent so that they will be 1.5 mm. apart for use in the lower anterior teeth. In the rest of the mouth, they can be from 2 to 3 mm. apart, this depending on the area. They are also bent lengthwise to fit the case at hand. Then they are carefully inserted in the pocket alongside the root until the bottom has been reached. Pressure is placed on the gum with the points away from the tooth. A short flash of current is turned on until the tissue is coagulated and the points are stepped over. The act is repeated until the entire pocket has been covered. The coagulated material can be carefully curetted at this time and nothing further is done to the pocket.

The teeth should be examined a week later. If any pockets have failed to close entirely, the teeth should be rechecked for the presence of any untoward conditions, such as occlusal trauma that may not have been previously eliminated. These conditions are corrected and the pockets again treated with the coagulator. In very deep pockets, coagulation may have to be performed several times at intervals of two weeks.

MOUTH HYGIENE

After the entire mouth has been treated and the teeth have been polished, instruction should be given to the patient on tooth-brushing technic and the home care of the oral cavity.

CONCLUSION

It is advisable to endeavor to determine the etiology in all cases of periodontoclasia. Diagnosis should be made and the prognosis of the case be determined. The occlusion should be carefully studied and corrected if found faulty. Treatment of the teeth should then begin.

The electrocoagulation unit is a great aid in the treatment of the periodontal pocket. Diathermic energy should be used to desiccate the epithelium and inflammatory tissues in the pocket and not to destroy the marginal or cemental gingiva.

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PROBLEMS THAT ARE MET IN THE TEACHING OF CHILDREN'S DENTISTRY TO UNDERGRADUATE AND POSTGRADUATE DENTAL STUDENTS

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DURING the past year, an anonymous dentist mailed to me three extracted deciduous teeth which came from the left side of the upper jaw of a 7-year-old boy. These teeth were the cuspid, the first molar and the second molar. The four interproximal cavities in them had been filled by two silver amalgam fillings. One filling, packed without a matrix in each set of two interproximal cavities, made a veritable, three-tooth silver amalgam bridge. All three teeth had abscessed; and the note that accompanied them stated that the dentist who inserted the fillings had never taken a course in children's dentistry.

One who has an appreciation for the proper care of the mouths of young patients, but finds "amalgam bridges" and evidence of even worse dental practice in children's mouths, may be tempted to comment on the preventive dentistry of 1938. No teacher of children's dentistry in the dental schools of the United States or Canada and none of the numerous papers that have been published on children's dentistry during the past five years advocate the insertion of a single amalgam filling in two adjoining deciduous teeth or the retention of untreated infected deciduous teeth in any child's mouth; yet evidence of both practices is found during every school examination. Does the poor practice of dentistry for children mean that the younger graduates are ill taught, that the older dentists are not keeping abreast of modern practice, that parents are not educated as to the importance of young children's teeth, that fees are too low for the adequate practice of children's dentistry, that dentists are afraid of preschool children or that the wrong type of men have entered

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the practice of dentistry? Possibly all six of these possibilities contribute their share to the generally poor practice of dentistry for younger patients.

THE HISTORY OF CHILDREN'S DENTISTRY IN THE UNDERGRADUATE CURRICULUM

A brief review of the increased attention that has been devoted to dentistry for children in the dental school curriculum for the last twelve years will serve as a background for the present discussion. The following statement has been copied from the 1926 report by Gies[1] on dental education in America (p. 232):

> No physical defects are so common in children as those of the teeth. The greatest concern of the dentist in private practice should be the oral health of the largest number of children he might be able to serve. Adequate oral health service during early childhood may be expected to assure the largest measure of enduring dental health thereafter.

At this time, Dr. Gies very clearly called the attention of dentists to the fundamental rôle of dentistry for the child in any program of dental prevention.

The American Society for the Promotion of Dentistry for Children was organized in 1927[2] for the stimulation, by every available means, of the practice of more and better children's dentistry. One of the promotive aims of this new organization was the incorporation of a course in children's dentistry in the curriculum of every dental school in the United States and Canada. How well this society has succeeded in this one particular aim may be decided from the following statistics: In 1928,[3] replies to a questionnaire by twenty-nine schools indicated that seven of them were giving lectures of some sort on children's dentistry. In 1932,[3] thirty-eight replies indicated that twenty-nine schools were lecturing on this subject. In 1935,[4] forty-one replies showed that thirty-eight schools had arranged to give lectures on the subject. In 1936,[5] forty-two schools of the forty-three that replied were giving lectures of this nature in various departments. Of these forty-two, thirty-one were giving courses which were designated distinctly as children's dentistry and which ranged from five to 128 hours in extent. Seven schools, in 1936, offered postgraduate courses, and three offered graduate instruction in this subject. Something definite, at least, on dentistry for the child patient is now being taught to the undergraduate in the majority of the dental schools.

The report of the Curriculum Survey Committee of the American Association of Dental Schools became available in 1935.[6] In it, the importance of children's dentistry to a preventive program is restated excellently (p. 31):

> Remedial preventive measures in dentistry include the detection and filling of small cavities, the prophylactic treatment of pits and fissures of teeth, the early recognition and treatment of gingivitis, the correction of malocclusion in young children, the removal of diseased teeth for the prevention of systemic infection, and the construction of dental restorations that are hygienically correct.

Unfortunately, in the subject matter of the "type" curriculum that has been outlined by this later survey, children's dentistry is not to be taught as such. It is to be acquired by the student as crumbs of information, here and there, from other courses, particularly from a course in the "Application of Preventive Principles in Dentistry" (p. 210). The course in application of preventive principles, however, is dismissed rather hastily "in view of the fact that the material of instruction in this course has not yet been fully developed." Since "remedial prevention" is to be applied to all age groups from the prenatal period to the period of senility (45 years of age, according to this study), it would seem logical to

include operative dentistry and prosthetic dentistry in this course if children's dentistry is to be likewise included.

As Hogeboom,[7] in a criticism of the curriculum survey, has pointed out (p. 384), "this basic subject is divided and subdivided until the power of personality that makes the teaching of prevention a practical, vital thing in everyday practice is dissipated and subordinated to a point of academic sterilization." One might conclude that one of the first problems in the teaching of children's dentistry is the failure of the Curriculum Survey Committee to outline a course in this subject. As has just been stated, however, thirty-eight schools had already begun to teach such a course when the report was published.

CONTENT OF AN UNDERGRADUATE COURSE

In spite of the amount of emphasis that is now being placed on the undergraduate teaching of children's dentistry in many dental schools, the average practitioner's idea of his children's practice is a practice for "spoiled little kids" that is rendered as a temporary, charitable gesture between his profitable adult appointments. Because of this attitude on the part of the average dentist, in no phase of dentistry has there been more irrational and empirical procedure than in the practice for children. Perhaps there is something wrong with undergraduate teaching; perhaps there should be an examination of the curriculum in children's dentistry to decide what can be taught. Is there anything left from the other dental or allied courses, and, if so, what may be included in an adequate course in children's dentistry? Content of the course is another of the problems in undergraduate teaching.

To date, there is no agreement on the name for that phase of dental science that deals with the treatment of children. In a dozen or more schools, the student takes a course in "pedodontia." In another school, he may elect a course in "pedodontology." In still another school, he may pursue a course in "dental pediatrics." In a number of other schools, the course is cataloged simply as "children's dentistry"; and quite commonly in dental literature one sees the term "pediodontia." Since the Greek "pedio" refers to feet and "pedo" to child, the choice of "pedo" would suggest itself. For the ending, it would appear logical to discontinue the adjective "ia" ending and select the noun ending for a science, "ics" or "ology." If one were to accept the trend in the naming of sciences, "pedodontics" would probably be the choice, following the example of the American Society of Orthodontists in its selection of the term "orthodontics."

Those who like to refer to the subject as children's dentistry, however, have an excellent reason for doing so. Everywhere, one hears references to the practice of dentistry for children as a specialty of the profession. Such an attitude is not at all correct, since dentistry for children still involves the general practice of dentistry for them. Some time or other, the dentist who includes a number of children among his patients will find occasion to make use of every subject that he has been taught in a dental school. This statement holds true from dental anatomy through all the subjects in the curriculum to the final phase of all practice, prosthetic dentistry. Not infrequently today, prosthetic appliances are made for children's mouths. Specialization does not involve the practice, but the patients.

Here the question might be raised, "Why, if the practice of children's dentistry involves the general practice of dentistry, does there need to be a special course in it for undergraduate students?" The answer is, "Because, in the practice of general dentistry for children, four special problems arise; and the solution of these four problems constitutes the objectives of any adequate course in children's dentistry." These problems are

(1) the management of the child patient, (2) the modified operative procedures necessary in the care of his teeth, (3) the dental problems that are involved in child growth and (4) the dental health education of the child patient.

CHILD MANAGEMENT

The first objective in the undergraduate course is the teaching of child management. It is amusing to find that men who graduated as recently as ten years ago actually fall into a panic at the thought of trying to operate on a 3-year-old child. Conversation at dental meetings is sufficient to convince any one that there are more dentists who are afraid of small children than there are small children who are afraid of dentists. Obviously, the primary prerequisite to filling a young patient's tooth is his dentist's ability to manage him. The dental student learns very early in his clinical practice that one pertinent fact always prevails, "no management, no filling!"

Since management is a much more acute problem with the child than with most adult patients, some opportunity should be afforded to manage young children clinically, and some lecture instruction can well be given on the approach to the control of the child. Since it is impracticable to bring courses on general psychology, genetic psychology, child psychology and mental hygiene into a dental curriculum, and since much of these subjects is taught as a report of research instead of a suggestion of applied principles for a specific group, such as dentists, some member of the dental faculty will have to develop common-sense technics for the approach to a child patient and interpret the principles of psychology which may be applied to the child-dentist situation. Such instruction, then, becomes the first objective in a course in children's dentistry.

MODIFIED OPERATIVE PROCEDURES

Since there are some differences between a child's teeth and those of an adult, and since there is a patient-management and fee-getting problem ever present during a child's appointment, the second objective in undergraduate teaching of children's dentistry is the development of, and instruction in, modified operative procedures. The operative procedures for a child's teeth demand that much more research, time and thought be devoted to them than could have been pictured twelve years ago.

In the first place, the student who works on a child's deciduous teeth immediately encounters a difference in shape, in texture, perhaps, and certainly in calcification and in physiology. These differences demand a somewhat different form of cavity preparation, slightly different filling materials and a quite different pulp management and root-canal technic. Likewise, the student will find a difference between the calcification of young permanent teeth in a child's mouth and that of the corresponding teeth in the mouth of an adult. These differences, again, will distinctly modify the pulp management of and root-canal work on these young permanent teeth.

As a preliminary step to the development of operative procedures for deciduous teeth, more instruction will be needed in the surface and pulp-chamber anatomy of these teeth, particularly of the molars. Much of the current information on the structure of deciduous teeth is inaccurate, but it has been accepted and quoted so long that it now amounts to folklore. It has been stated that the pulp chambers of deciduous teeth are larger than those of the permanent teeth, but a radiogram of any child's teeth will show that they are large in a relative sense only. They have much less enamel and dentin surrounding them. Statements have been printed frequently that the dentin of deciduous teeth is soft, that it cuts readily and that it "soaks up drugs like blotting paper." In reality, there is not the difference that one has

been led to expect. The report of Hodge[8] and his group shows that deciduous teeth have practically the same chemical analysis as do young permanent teeth.

An examination of the dental literature for 1936-1937 revealed four different criteria that were used as a basis for the treatment of putrescent deciduous teeth. These criteria were based upon the amount of resorption of tooth root. One operator would extract all such teeth if resorption had begun; another if one-third of the roots were absorbed; still another if two-thirds of the roots were gone; while a fourth used a resorption of three-fourths of the root length as an indication for extraction. None of them based the extraction on failure to obtain negative cultures bacteriologically; and all of them appeared to be unfamiliar with the excellent work of Kronfeld[9] on the calcification, eruption and resorption of deciduous teeth. When one consults Kronfeld's table,[10] he finds that the deciduous molars, on which the bulk of deciduous root-canal work is attempted, begin to resorb at from 4 to 5 years. Progressive periods of resorption follow, alternating with successive periods of rest, in which bone and cementum repair the resorbed area. With these physiologic conditions functioning, the critical reader might wonder how an operator, as he studies the radiogram of a child's teeth, knows to what extent a deciduous root is resorbed.

Many operators have been dissatisfied by the results of their attempts to place a matrix on a deciduous molar, when a study of the external anatomic form of the tooth would have aided in the solution of this annoying problem. Many operators have declared their inability to cut deeply enough in a deciduous molar to keep the filling in place, when a study of the anatomy of the pulp chamber would have revealed in molar crowns a bulk of hard tissues adequate to retain fillings permanently. The old statement of dentists and parents "deciduous teeth will not hold fillings" requires an amendment to keep pace with today's information. It should read, "deciduous teeth will hold permanent fillings."

Contrary to the long accepted idea that any hastily placed germicidal cement filling will do for a cavity in a deciduous tooth, it has been found that adequate two-surface fillings have to be inserted to take care of proximal cavities in deciduous molars. Such fillings have to be placed very carefully in the second molars of a 5-year-old child in order that they may last the ensuing period of six years until these teeth are normally exfoliated. Just so many "corners" may be "cut" in the insertion of such fillings before the child's mother comes back to the dentist with the embarrassing information that "the fillings fell out."

In the past, the choice of filling materials for children's teeth has been made many times on the basis of ease of insertion or on the basis of what the operator has been accustomed to use. Since 1928, the yearly research of the members of the dental group at the Bureau of Standards has been available to serve as a guide in the selection of filling materials. With the publication last year of a specification for silicate cements, the set of standards is practically complete. There is now little excuse for the dentist to fail to avail himself of the accurate information that was formerly possessed by the mechanical engineer and the metallurgist alone. Every informed practitioner should now be suspicious of "kiddy" filling materials, and every undergraduate should be taught this attitude while he is in school.

If operative technics for deciduous teeth are intended to be used by the student in his private practice after he graduates, they must be just as simple as is consistent with adequate practice. When the student enters practice in a community where laymen still think quite generally that any type of work (or none at all) is good enough for decidu-

ous teeth, he will soon find that children's fillings are the most difficult part of his work for which to get a just fee. Furthermore, the less complex the procedure taught him, the less of a management problem he will have when he operates on a child in the dental chair.

The second objective in the presentation of a course in children's dentistry might be summarized as the development and teaching of operative procedures which take into consideration (1) the histologic and anatomic differences in the teeth on which the student works, (2) the adequacy of the repair which he makes and (3) the simplicity of the technic with which he makes the repair. The development of such operative procedures would seem to demand special attention by the operative department of any school, if it is not to be delegated to a special department of children's dentistry.

THE PROBLEM OF GROWTH

The third objective in a program of children's dentistry for the student is the presentation of the problem of child growth, along with some instruction to show the student how he may direct it. When a student is operating on a child patient, he is working on arches which will increase greatly in size and change contour to accommodate the permanent dentition. He is working on deciduous teeth whose roots are being resorbed, and he is working on newly erupted permanent teeth with unformed roots. Along with the practice of operative dentistry, under these conditions, goes a definite responsibility for the prevention of malocclusion. With orthodontists asserting that from 40 to 60 per cent of mechanically caused malocclusion is preventable, this responsibility is one that the dentist should not evade. Good adult occlusion is very often dependent on preservation of function in the deciduous teeth and arches, and the adequate preservation of function is something which general practitioners can readily accomplish, if they seriously set themselves to do so.

To insure good occlusion, to help prevent dental caries and to secure wider health service for small patients, a knowledge of a number of sciences may have to be incorporated in a course in children's dentistry. One may mention anthropology, clinical microscopy, embryology, endocrinology, heredity, internal medicine, nutrition, pediatrics, physical diagnosis and preventive orthodontics as sources of information on growth which create a background on development. Such a background serves the orthodontist in his diagnosis and planning, but is not shared by the general practitioner. More of this background of growth will have to be added to the general dentist's experience before the possibilities of a preventive program for children will ever be appreciated or employed.

The statement probably is true that much more malocclusion is overlooked in the examination of children's mouths than is ever detected, because the average dentist neglects one small detail, examination of the child's teeth when they are closed in occlusion. The cross-bites, the "habit" cases and most of the anteroposterior malrelations will be missed entirely without this single detail in examination. Failure to fill small cavities for the prevention of large cavities, failure to restore the full mesiodistal diameter when deciduous teeth are filled, ruthless extractions, failure to retain space when early loss occurs and failure to extract deciduous teeth when they should be removed are among the errors that result in many cases of malocclusion and deformed profiles. These occur simply because dentists lack vision.

Unscientific advice on diet, along with a prescription of proprietary food products, which allies the dentist with the commercial producer, is given constantly because the dentist has forgotten the limits that are set by human physiology.

It would be interesting to know how many pregnant women have been fed dicalcium phosphate tablets to prevent dental caries in their children's permanent teeth, how many children have had orange juice prescribed to prevent dental caries, how many fourth-grade children have taken viosterol to secure well-calcified permanent teeth and how many bad cases of measles at 5 years of age have been credited with the production of hypoplastic enamel on the first permanent molars.

A dentist who has limited his practice exclusively to children states that two or three times a month an irritated mother comes to his office prepared to give him a terrific "tongue-lashing." Each of these mothers has told him the same story: During her pregnancy, she was under the care of an obstetrician and followed his directions explicitly in regard to rest, exercise and diet. Three months after her child was born, he was placed in the care of a pediatrician and she has followed the pediatrician's orders explicitly. Her son has had four glasses of milk a day, he has eaten an abundance of green vegetables, fresh fruits, eggs and whole grain cereals; he has had his glass of orange juice every morning, and he has had a tablespoonful of cod-liver oil each day during the winter months. In spite of all of this dietary care, the dentist finds four, five, six or eight cavities. These mothers demand to know, "What is the trouble?"

This dentist should have told these mothers that they have fed their children excellently for normal growth and well-developed teeth and jaws, but they have failed to keep the one thing out of their children's diets which causes unhealthy teeth, and that is sugar. Similarly, there is a surprise for mothers in the fact that the permanent teeth do not commence to form until birth; that vitamin C benefits the supporting structures of teeth rather than their enamel; that the crowns of all the permanent teeth except the third molars are calcified at the average age of 7 years; that the enamel on the crowns of the first permanent molars is completed at 3 years; that poorly calcified teeth may not decay and that well-calcified teeth often do, and that embryologists and physiologists all over the country are wondering how dentists expect to improve enamel by diet after the cells that lay it down are lost. Diet, in its relation to growth and dental caries, is an important part of the content of a course in children's dentistry, provided the correct relationship is pointed out to the student.

Dentists in private practice see many of their young patients much more frequently and much more regularly than does the physician. Dentists will have an unusual opportunity to broaden their usefulness as health servants if they can be taught sufficient regional, physical diagnosis to become suspicious of signs and symptoms and refer children with those symptoms to the pediatrician. The gait, the posture, the hands, the legs, the shape of the head and the indications in the face, the eyes, the mouth and the cervical glands all tell a story of maldevelopment or systemic disease which will awaken the suspicion of the trained dentist and result in reference of the diseased child to a physician. The children's dentist will have a fertile field for cooperation with the pediatrician if he can fit himself to cultivate this field.

The third objective in an undergraduate course in children's dentistry may be summarized as an authentic presentation of the problem of child growth as it relates to the orthodontist, the dietitian and the pediatrician. Today, the time should have passed when the dentist practices as a mere mechanic instead of a health servant. The interest which Paul Revere had in a single isolated tooth in a patient's mouth has broadened. The dentist, in 1938, should be interested in a properly functioning mouth behind each tooth, because poorly formed jaws and

irregular teeth are neither healthful nor good-looking. He should likewise be interested in a properly functioning body behind each mouth, since broken-down and infected teeth may destroy sound bodies; and he should be still further interested in a properly functioning personality behind each body, because physically unhealthy bodies subtract one entire component from the complex of physical, mental, emotional and social health which goes to make the maximum in healthful living.

PATIENT EDUCATION

A number of times, the criticism has come from dentists who are employed in public health work, "Dental schools turn out very good operators each June, but very poor teachers." Because public health workers observe that many lay people are grossly uninformed as to what constitutes a good dental health program, they are apt to become critical of the average dentist. They reason: "The dentist has not taken time to instruct lay people properly in his dental chair and he has shirked his educational responsibility as a community undertaking." The public health worker, perhaps, is not entitled to "cast stones" until he can be certain that his own educational attempts are functioning to their maximum capacity. However, one who looks independently at the practice of dentistry frequently feels compelled to admit that the drugstore window, the popular magazine stand and the radio broadcasting studio have combined to take over one phase of the dentist's private practice of dentistry, the dental health education of his own patients.

In return for the state's investment in him, the graduate from a state-financed professional school is undoubtedly expected to serve scientifically the citizens of his community and to assume a leadership in movements for community betterment, particularly for the benefit of community health. The dental student graduates owing this debt to the state. When one recalls the rôle which the practice of dentistry for children plays in a preventive program, he can better understand that the greatest need for lay education exists among parents and children and that the development of dentist-teachers becomes a logical fourth objective in the undergraduate course in children's dentistry.

The average parents actually have very inadequate information regarding dental practice. One of the frequent questions which they ask the dentist is, "What do you charge for children's fillings?" Few parents realize that although there should be a difference between the fee for a buccal pit filling and that for a large restoration, there is no difference in the amount of work that is demanded for a filling of the same material in a child's mouth and in an adult's. Most parents think that the dentist merely drills decay out of a child's tooth and plugs with a plastic material the hole that remains. Few parents realize that the dentist strives for a definite form in cavity preparation to retain the filling, to resist stresses and to prevent recurrence of marginal caries. Most parents insist that their children brush their teeth, but few know that children should brush their gums in a proper manner, as well as their teeth. Most parents are willing to add a mineral or vitamin prescription to the family diet to prevent dental caries, but few will take sugar out of the family diet to do so.

The past generation of dentists gave the grandparents of the present generation of school children so much misinformation about children's teeth that an accumulation of folklore about the deciduous teeth still exists. The past generation of dentists told the parents of their day that temporary fillings were good enough for temporary teeth; that temporary teeth would not hold fillings; that abscessed temporary teeth should be opened for drainage and left to hold

space for the permanent teeth; that temporary teeth had no nerves or roots; that a child's crooked teeth should always be left undisturbed until 12 years of age; that periapical abscesses in a child's mouth were harmless gum boils, and that time and money should not be wasted on temporary teeth because they were going to fall out soon anyhow. Such folklore will have to be dissipated in many communities before the new graduate who settles there can hope to practice profitably for children.

To educate the laity, the dental student after graduation will need some information from his school. He will want to know to what sources he can go for authentic information and how this information can best be presented. He will have to learn the relative value of isolated school talks as compared to cooperation with teachers' health committees in the presentation of advice and materials, and he will have to learn that broadcast talks should not be confined to a statement of the eruption times of teeth, but rather to the initiation of proper habits and attitudes. He will have to learn to take part in consumer education as it concerns dentifrices, mouthwashes, stain removers, alkalizers, teething lotions, pyorrhea cures and pain relievers, and he will have to learn to teach preschool children to become good patients. Finally, he should be made to realize the truth of a statement which a professor of speech from the University of Chicago made at a dental meeting[11]: "The more patients know about dentistry, the more they consult their dentist." To this statement could be added, "and the more frequently they demand and are willing to pay for good dental care."

The development of graduates who can teach patients dental health habits completes the four objectives that have been suggested as a basis for the content of an undergraduate course in children's dentistry. In an effort to attain the four objectives that have been discussed, enough tasks will have been developed to earn a place for children's dentistry in the undergraduate curriculum.

POSTGRADUATE EDUCATION IN CHILDREN'S DENTISTRY

One may study, briefly, the problems that are encountered when postgraduate education in children's dentistry is undertaken. The older practitioner who comes back to school for a postgraduate course will need, in condensed form, the same material on dentistry for children that the undergraduate needs, since he has never taken a course previously. If he has been out of school more than five years, he will probably need, in addition, a "refresher" course on materials and their manipulation. Owing to the activity of the groups at the Bureau of Standards and other research laboratories, dental materials and the technics for their use have changed very rapidly, and the same thing, to a lesser degree, is true of all operative procedures. The "refresher" course has appeared to fill a needed niche in the general practitioner's continued training. For the practitioners who are located within the area near the dental school, the refresher course may be a day-a-week course for a year; for those men who are at a greater distance from the dental school, the concentrated, two-weeks course will be more advantageous, and for each of these groups, extension courses may be worked out which consume the minimum of the practitioner's time. In any case, the development of refresher courses is a problem in administration for the dental schools and a problem in the stimulation of demand for organized dentistry or the profession generally.

Beyond the organization of instruction and the demand for postgraduate courses in children's dentistry, there is one further problem in postgraduate teaching. It may be designated as a problem in the development of a changed professional attitude, particularly among the

rural or small-town dentists. In many of the small communities, the one, two, three, four or five dentist communities, the practice of dentistry for young patients is still the practice of the 1890's. There are actually small communities in which all of the children's dentistry practiced is the use of silver nitrate solution alone on every tooth with leathery dentin. There are other small communities where all of the children's dentistry is practiced with a single pair of universal forceps. There are still other communities where all of the children's dentistry is practiced with the aid of one bottle of "false-prophet" cement powder. I visited one other community where children's dentistry was practiced by a prescription of dicalcium phosphate tablets for every child that went to the dentist.

Frequently, the report has come from essayists and clinicians presenting information on children's dentistry that they are invariably embarrassed at meetings by a group of dentists that contribute to a back-of-the-room conversation with remarks like these: "That may work in his practice, but I would like to see him try it on the children in my practice." "I could fill three teeth while he is getting ready to insert one amalgam filling." "He couldn't do that in my practice and get paid for it." "How are we going to do all of this for fifty cents or a dollar?" Usually, the question is raised also, "How is a father of seven children going to pay for their fillings when he is working but three days a week?"

There is little chance to interest the members of groups of this kind in adequate dental practice for children, and the attitude that prompts such remarks is discouraging to all that is modern in our concept of preventive dentistry. The background of these remarks is usually a very vicious type of dental practice—the professional sale of fillings instead of the practice of health service. In some manner, the dentists who have graduated in years past and who have not learned to practice health service must be re-educated.

The problem of dental care for indigents will never be solved by charity on the part of the dentist. The underprivileged groups will require assistance from taxation or philanthropy, or both, if dental service ever becomes available to them. The father of seven who is working but three days a week will have to buy his family luxuries at the ten-cent store or the country general store. This parent's condition does not need to drive the dentist in his community to competition with the marginal patient and the sale of "ten-cent-store" fillings. That, however, is exactly what happens in many small communities, and, in time, the dentist can plan to lose money under this system on every child's filling that he inserts. Soon he ceases to practice dentistry for children or degenerates to the status of another one of those operators whose fillings fall out.

In every community, there are 5, 10, 15, 20 or 25 per cent of adults who can afford to pay an adequate fee for adequate dental care. These adults can afford to do the same thing for their children. For any one who has faith in dentistry as a profession, it is hard to believe that dentistry for any one, either adult or child, has to be practiced on a plane which pays the dentist a pittance and sacrifices best effort, accurate technic and even professional ideals.

Already a small backfire of criticism has been heard from public health workers, social workers and school teachers, "Why educate people to take children to the dentist when the dentist will not take care of children's teeth?" With a program of federal medicine so widely discussed at present, lay criticism of dental practice may bear sufficient weight in the future to balance the scales of public opinion on the side of state controlled dentistry.

The improvement of the plane of

practice for children in the smaller centers would do much to eradicate professional contamination of the recent graduate. During the period of national depression, many of the recent graduates located in the smaller towns, where they often have had to meet the competition of 1890 dental practice. The competition of 50-cent extractions and 50-cent and one-dollar amalgam fillings will not help to promote the practice of health service which the recent graduate learned in school. By far the biggest problem in the teaching of children's dentistry is the promotion of a change in professional attitude.

As Gies[1] so well said in 1926, "The keys to progress in dentistry are the practitioner who serves the patient directly, the teacher who instructs and trains the practitioner, and the investigator who extends the knowledge on which teaching and most of the improvements in practice depend." Instruction and investigation are largely the problems of the dental schools; the attitude of the practitioner is largely the problem of organized dentistry.

SUMMARY

This paper is an attempt to present some of the problems that exist in the teaching of dentistry for children. The content of an adequate undergraduate course in children's dentistry develops into four problems: (1) instruction in the management of child behavior; (2) the development of operative procedures for treating deciduous and young permanent teeth as modified by considerations of anatomy and physiology, adequacy and simplicity; (3) the presentation of information on child growth and its guidance, and (4) the development of dentist teachers. Postgraduate instruction in children's dentistry requires the solution of three problems: (1) the establishment of a condensed course in undergraduate children's dentistry; (2) the establishment of a refresher course in materials and operative technics, and (3) the development of a health-service point of view in the older practitioner.

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CONSERVATIVE TREATMENT OF PERIODONTOCLASIA

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PERIODONTOCLASIA is an infection of the periodontal tissues starting at the base of the gingival sulcus. It may be so slow in its development that thirty years elapse between the time of its beginning and the time that its progress is discovered. Its progress is so slow that it may be entirely unnoticed by the patient and even the careless dentist until some of the tooth roots are hopelessly denuded of their attachment. Local irritants play a part in the location of the periodontal areas involved and systemic deficiencies may determine the rate of progress of the lesions. The slowness of progress and the influence of local and systemic predisposing factors must not blind us to the primary fact that periodontoclasia is a series of infectious lesions caused by the ordinary mouth bacteria slowly invading the attaching tissues of the tooth root at the base of the gingival sulcus.

Infection of the periodontal structures differs from the chronic infection elsewhere in the body in the fact that, once started, it has effects which perpetuate it. Inflammation causes loosening of the marginal gingivae, leading to development of a wide sulcus, which fills up with débris, chiefly a bacterial mass, which is not removed by careful brushing of the teeth. The presence of the stagnant space with its coating of microorganisms on the tooth surface predisposes the teeth to deposit of subgingival calculus, the calcium salts of which may come either from the saliva or from exudate out of the inflamed gingival lining. Calculus on the tooth surface cannot be removed by the tissues, and since it is porous and full of bacteria, it acts as a permanent source of infection for further destruction of the attaching tissue. As the white fibers of the periodontal attachment are destroyed by the inflammatory reaction, epithelium grows down along the tooth root to wall off the underlying tissue from the bacteria in the sulcus. This epithelial lining tends to make permanent the detachment of the white connective tissue fibers from the cementum. Without intervention, therefore, periodontoclasia is a self-perpetuating infection, ceasing only when the tooth root is exfoliated and the sulcus or pocket is thus obliterated.

Treatment of periodontoclasia without loss of the tooth consists primarily in the elimination of infection and the sources of infection, the bacterial masses on the exposed tooth surface and in the gingival sulcus or periodontal pocket and the bacteria that have penetrated and are living in the surrounding soft tissues. There are two generally used methods of elimination. One is surgical removal of the involved tissue to the base of the pocket, covering the remaining shelf of raw tissue and the exposed tooth root with an antiseptic, sedative cement until healing has occurred. Various surgical modifications of this method, such as electrocoagulation and the flap operation,

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are essentially the same in that the infected tissue is removed and the gingival level lowered to approximate the bottom of the periodontal pocket. The conservative treatment, on the other hand, is the elimination of infection without removal of the covering tissue of the root. It is a far more difficult and exacting technic, but it has the great advantage that it leads to much less gingival recession in the end. Both of these methods have their place, but, in my experience, the occasions when resection is indicated or necessary are comparatively infrequent.

INSTRUMENTAL TREATMENT

The conservative treatment consists essentially of instrumentation to remove calculus, bacterial accumulation and roughness from the root surface, and home care by which the exposed tooth surfaces are kept clean and the infected periodontal tissues are massaged. Massage, the alternate compression and release of the inflamed tissue, acts to break up the congestion and reestablish the normal blood flow. This has the effect of ridding the tissue of bacteria and permitting the replacement of flabby granulation tissue with normal dense white fibrous connective tissue, bone and a healthy covering of epithelium. Under favorable conditions, the epithelium attaches itself to the clean cementum surface, the pocket being thus obliterated with little if any lowering of the gingival level about the tooth. Bone gradually builds in as far as the matrix of periodontal fibers still attached to the cementum permits. The theory is simple, but the execution is difficult. Owing to lack of training, comparatively few dentists have become sufficiently expert in the technic to obtain complete healing in advanced cases.

Although the technic of root surface curettage is difficult and exacting, it is no more so than that of other phases of dental practice. The chief difference is that it requires an educated tactile sense in the finger tips not required by other dental technics in which the field of operation is open to vision. Most of the root surface to be curetted is under the gingival tissue and out of sight. The chief effort in technical training in periodontia is necessarily exerted in so educating the tactile sense that the operator can distinguish the different structures which his instrument touches. These structures are the line of attachment of the periodontal tissues to the tooth, unplaned cementum, bacterial slime on the root surface, nodules or cavities in the cementum, porous cementum, calculus, whether rough or smooth, filling margins, uncovered margins of bone, exposed dentin and poorly planed cementum, as well as the irregularities in root form due to bifurcations, longitudinal grooves, overhanging enamel margins, etc.

The purpose of instrumentation is to remove any lodging place for bacteria by removing all deposits, rounding out angles and corners and shaving the cementum just enough to remove Sharpey's fiber ends and leave the surface as smooth and free from pores as possible. Since the pores extend into the cementum only a few micromillimeters, the amount of planing necessary after deposits and roughness are removed is almost infinitesimal. The cementum may be very thin; in fact, it usually is thin near its junction with the enamel. Excessive shaving may easily cut through it into the dentin beneath, leaving a surface which is very porous and is sensitive to instrumentation both at that time and later; which is especially disagreeable if it is exposed by recession of the gingiva.

The chief difficulty is to remove all subgingival calculus. The gingival tissues will not reattach themselves if any calculus remains, for the reason that a zone of infection and inflammation with exudate continues about any mass of calculus no matter how minute or smooth it may be. The presence of exudate pre-

vents the close adaptation of the gingival tissues to the tooth root necessary for reattachment. A careful examination of the tooth roots extracted after unsuccessful treatment, especially in advanced pockets on molars, will usually disclose specks of calculus which were not removed at the time of treatment. Only the greatest care and skill with well adapted and sharp instruments make it possible in all cases, especially if pockets are deep and not easy of access, to remove all traces of calculus. It is probable that no one removes all calculus in all cases.

In searching for subgingival calculus, it is not enough to feel the root surface. Calculus will frequently fill up a longitudinal groove in a root and leave a comparatively smooth surface in which the exploring instrument does not catch. It is this fact which makes it necessary to have an educated tactile sense. It is only with a sharp cutting edge that the difference between the planed cementum and smooth calculus can be detected. Calculus, no matter how smooth, feels like stone to the sharp curet or plane, while well-planed cementum feels like polished ivory. The removal of the calculus, once found, is not so difficult as to find it and to be certain that it has all been removed.

It is better to remove all calculus and finish each root surface at the first time of operating on a tooth. The practice of going superficially over all the teeth at the first sitting and then going deeper into the remaining pockets at later sittings is not good, in my opinion, for the reason that some healing may occur after the first treatment, which may make it more difficult to get into the deepest portions of the pockets later on. The hardest cases from an instrumental standpoint are those in which deep pockets with subgingival calculus exist beneath superficially healthy, tight gingival tissues. The tight gingiva hampers freedom of movement in the pocket and makes distinctions as to the structures being touched less accurate. It is better to develop a technic by which complete root surface treatment can be rendered at the first operation on the tooth while the surrounding tissues are loose and the area is slightly anesthetized by the chronic congestion. It may be necessary later on to treat it again if the pocket does not close up properly, to remove bacterial slime which may have grown back in and to massage the deep area by means of instrumentation, but it should not be necessary to do further curetting with sharp instruments.

The instruments to be used for root surface treatment are important, but not so important as the skill in their use and especially the development of the tactile sense. Skilful root surface curettage is being carried out with hoe scalers, curet scalers, periodontal files, Towner's periplanes and other instruments. Many dentists are doing excellent work in root surface curettage with not more than a dozen carefully selected instruments. The tendency is toward the use of small-headed delicate instruments which will reach to the bottom of pockets without pressure or stretching of the surrounding tissues. The instruments must be devised to give access to all kinds of pockets, some of which in their spiral direction around a root offer great difficulties.

It is not often necessary to use a local anesthetic for root surface curettage. The chronic congestion renders the tissues somewhat sluggish in pain response in most instances, but even if this is not the case, careful instrumentation with well-adapted instruments offers but slight injury to the soft tissues of the pocket. While it is somewhat painful, most patients do not find it enough so to desire an anesthetic. There is no purpose to be gained in punching into the periodontal attachment with more than enough pressure to determine definitely where it is. The early treatment practiced by Riggs, in which he lacerated the tissue at the

pocket depth in order to break up the congestion, is considered unnecessarily drastic at this time.

GINGIVAL MASSAGE

The treatment to render the root and crown surface comparatively bacteria free having been completed, massage is employed to break up congestion, restore the circulation to normal and rid the surrounding tissues of invading micro-organisms. Periodontal massage consists of alternate compression and release of gum tissue, so devised that the squeezing reaches to the farthest area of congestion. This may be done with a stiff toothbrush properly used or a shaped wooden stick or by the finger in a rubber cot with blunt rubber points to penetrate the soft spots more deeply. Any or all of these may be necessary in any given case for massage where needed. It is not enough to tell the patient to rub the gums with the finger. Very often, the congested flabby area may be between two roots with a sound buccal wall of bone between it and the point of application of the finger. Proper use of dental floss not only cleans the proximal surfaces of the teeth, but also acts as a general agent for massage by bringing pressure on the interproximal tissues beneath the gingival sulcus. To assure that the massage to be applied by the patient reaches the depths of every flabby area about the tooth roots may tax the ingenuity and patience of the operator. In some cases, it is necessary to have the patient return at frequent intervals for short appointments, at which all remaining pockets are entered to remove the bacterial slime which has grown in and to bring pressure with the instruments on the deep flabby areas, as well as to give a gingival massage to all areas needing it.

After the tissues have once healed, it is not difficult for the patient to maintain sufficient massage with the toothbrush and dental floss alone. He may express alarm at the idea of compressing the gingival margin as though pushing it back, on the ground that it will cause recession, but this is not apt to occur except as inflamed, congested or hypertrophied tissue shrinks as it is replaced with dense fibrous tissue. This much shrinkage and recession cannot be helped. In my experience, the common cause of gingival recession on the labial and buccal surfaces is toothbrush abrasion. Just why the gingival tissues shrink when the surface layers of epithelium are scrubbed off, I do not know; but that they do, I am certain. The gums need vigorous compression to keep them in normal function, but this should not be accompanied by any action which tends to abrade or scrub off the surface epithelial layers.

TOOTHBRUSH TECHNIC

The brushing technic is therefore of paramount importance. It must clean the teeth thoroughly of bacterial slime and salivary deposits to the gingival line and give a vigorous compression massage to the gingiva from the margin, without, at the same time, scrubbing away the thin keratin layer and superficial cells of the gingiva or cutting grooves in the teeth. Most of the best known brushing technics do not meet these requirements. Even Charters' method, which has gained the greatest approval, is not entirely satisfactory as it is interpreted and taught by many dentists. As Stillman and McCall interpret it in their text (1922 edition, pp. 227-228):

> The brush is next placed upon the labial surface of the upper incisors, resting partly on the gingival tissue, with the bristles pointed slightly upward; in other words not forming quite a right angle to the tooth. Sufficient pressure is given the brush to produce a perceptible blanching of the gingival tissue—the brush is now given a rapid but slight mesio-distal movement, the pressure being maintained. The combined effect is that the bristle ends remain virtually upon the spot upon which they have been placed. In other words the bristles do not pass over

the tooth and gingival surface in the manner of a scrubbing brush, although the handle is manipulated as in the case of a scrubbing brush. The extent to which the handle may be moved without displacing the bristles from the spot on which they were placed, depends of course on the length and flexibility of the bristles. The brush when so used penetrates the interdental embrasures deeply. The movement of the bristle ends, while very slight when combined with the steady pressure applied, is entirely adequate to the cleansing of the tooth surface, while at the same time producing on the soft tissues the effect of a deep vibratory massage. The patient is to be warned not to carry the brush high on the gingiva, as this method may produce irritation of the areolar mucosa.

The criticism of this method is threefold: 1. The bristles are pointed slightly toward the gingiva and rest partly on the gingiva. This will have the effect of forcing some bristles into the sulcus, with a tendency to pierce the line of attachment of the gingiva to the tooth surface, resulting in recession. Hirschfield has well shown the destructive effect if the bristles are forced to the point where they reach and injure the line of attachment. 2. The ends of the bristles resting partly on the gingiva tend to injure the keratin layer and superficial cells of the covering epithelium, recession again resulting, especially if the gingiva is thin with no immediate underlying bone. 3. The firm pressure without perceptible movement of the bristle ends tends to smash the brush; that is, break the bristles and quickly ruin the brush, at the same time failing to remove the bacterial slime from the tooth surfaces.

Instructions for practicing the Charters method, as described by Charters himself, are as follows:

> Place the brush at right angles to the long axis of the teeth, the points of the bristle in contact with the surfaces; then gently force the bristles between the teeth, being careful not to pierce the gums. With the bristles between the teeth, exerting as much pressure as possible, give the brush several slight rotary or vibratory movements causing the sides of the bristles to come in contact with the gum margin and producing ideal massage. Be careful not to make this movement sufficient to remove the bristles from between the teeth. After making three or four small circles, remove and replace in the same area. Make three or four applications in the same place. The reason for this is that the points of the bristles strike the labial, buccal and lingual surfaces, then slide into the interproximal spaces. Move the distance of one embrasure and repeat the process, holding the sides of the bristles firmly on the gum margin. The V-shaped spaces between the teeth assist in crowding the sides of the bristles against the gingivae. Where teeth are missing, we have to depend on our sense of touch to keep the proper pressure, with the sides of the bristles on the gum margin.
>
> Be sure to enter every embrasure from both the outer and inner surfaces on both upper and lower teeth. Most of the third molars, which, because of the close proximity of the ramus of the jaws and the soft tissue in that region, cannot be approached at right angles, must receive more careful attention, and the brush should be tipped so that the bristle ends reach the outer and inner sides.

The difficulty with the Charters method is to get patients to give sufficient movement to the handle of the brush while "giving the brush several slight rotary or vibratory movements" to make the bristle ends loosen all the bacterial slime from the tooth surfaces, and, at the same time, not give so much pressure that the bristles are broken and the brush is ruined.

A method which I have found effective and which meets requirements for the labial and buccal surfaces is to place the teeth edge-to-edge, place the brush with the bristles against the teeth at right angles to the long axis of the teeth and then brush vigorously, without great pressure, with a stroke which is mostly up and down on the tooth surfaces, with just a slight rotation or circular movement after striking the gingival margin with force. Enough pressure is used to force the bristles into the embrasure areas, but not enough to injure the brush.

Although the stroke is long enough up and down that in brushing the upper the lower teeth are touched, it is not intended that the upper and lower teeth shall be brushed in the same series of strokes. The teeth are placed edge-to-edge to keep the brush from slipping over the occlusal edges and being displaced. This method cleans the buccal and labial tooth surfaces and embrasure areas efficiently, affords vigorous gingival massage, does not abrade the gums or teeth, does not ruin a good toothbrush and is not difficult for the patient to learn. The method, like Charters' method, calls for the best grade of hard bristle brush.

It is more effective for patients to brush the teeth thoroughly twice a day, morning and evening, with brushes that have dried for twenty-four hours between uses, than to brush less thoroughly several times a day with brushes that are not thoroughly dried between uses. The bacterial slime and salivary deposit are the dangerous factors in periodontal cases, not food débris after meals. Thorough brushing twice daily, with floss properly used once a day, is sufficient to maintain the sanitation and hygiene of the oral cavity. Ten minutes a day intelligently and efficiently used will keep most natural dentures in an excellent state of health.

DENTAL FLOSS TECHNIC

Whenever the interdental papillae have receded enough to leave a space between the gingiva and the contact point, it is essential to use dental floss daily. The floss, to be held tight, is twisted about the middle fingers and is spanned over the ends of the two forefingers or two thumbs or one forefinger and one thumb. These two fingers only are inserted in the mouth. The span between the two fingers' ends is not over one half inch in length and is held very tightly until it is passed beyond the contact points between the two teeth. It is then bent around one tooth, the patient making sure that the floss is around the same tooth on the inside as on the outside and is as far up toward the gum on the inside as on the outside. It is then slipped up and down several times between the contact point and the base of the gingival sulcus. It is held tightly enough to wipe off all adherent slime on the tooth surface and at the same time is pushed up far enough between the gum and tooth at each stroke to give a definite sense of pressure against the tissue, but not enough to cause pain. It is then bent about the adjacent tooth surface in the same interproximal space and the process repeated. This treatment is given to all proximal tooth surfaces. When one is skilful, it takes only one minute to give this cleaning and massage to all the proximal tooth surfaces.

REATTACHMENT

One of the most controversial subjects in the field of periodontology is reattachment. Does it really occur? If it does, is it a reattachment of the connective tissue fibers to a new layer of cementum or is it an attachment of the epithelial lining of the pocket to the root surface? Or is apparent reattachment simply an adherence of the surrounding gingivae so tightly to the tooth root that the explorer cannot enter it? Or does the gingiva recede as healing progresses, until a normal gingival sulcus depth is reached, the result being much like that which would occur a year or two after gingival resection? The essential argument for the difficult conservative treatment of periodontoclasia as against the easier resection treatment or one of its modifications is that reattachment does occur, pockets being obliterated with comparatively little recession, and teeth may be retained indefinitely in health without the objectionable features resulting from any considerable gingival resection.

Even when reattachment is not complete (and there are mechanical reasons

why it cannot be in many cases), if the problems incidental to root surface curettage, massage, sanitation and relief of traumatic injury are solved, such adherence of the surrounding tissue occurs as to eliminate space between it and the root and permit a healthy result. Such a result is not so desirable as complete reattachment, for the tendency is for such tissue to recede in time, while reattached tissue may never recede at all. But even if there is no complete reattachment and hence there is some recession, it is probably not often so much as that following resection, even though it is admitted that there is considerable regrowth of covering gingiva within two years following resection.

The basis for the statement that reattachment does occur is both clinical and histologic. It is the common experience of dentists who are trained in the conservative technic that pockets sometimes reaching nearly to the apex of the teeth disappear after treatment, without appreciable gingival recession. The explorer introduced into the gingival sulcus where once the pocket existed passes no farther than the normal sulcus depth before it comes in contact with a definite line of attachment. It cannot be pushed farther without pain similar to that from pushing an explorer into the attachment of any normal gingival sulcus. It is not just tightly hugging the tissue: it is a definite line of attachment, distinct to any one familiar with this field.

The histologic evidence is that given by Harold K. Box in his booklet "Studies in Periodontal Pathology" page 75, showing connective tissue and epithelium definitely attached to the root of a lower lateral incisor where formerly a pocket had existed and had been treated. William M. Reppeto, of Dallas, Texas, also showed sections at the Better Dentistry Meeting in New York in 1936 of a molar tooth and surrounding tissue which had been treated. The area where the pocket had existed was completely reattached with the epithelial tissue which had lined the pocket. There was no question of the epithelium hugging the tooth root. The attachment of the epithelial cells to the cementum and even the dentin in one area where it had been exposed by overcurettage was quite definite.

As yet, the evidence indicates that the reattachment is mostly by means of the epithelium which lines the pocket, although there is some evidence that this in time may be replaced by white fibrous connective tissue embedded in new cementum to form new pericementum. Willard C. Fleming, of San Francisco, showed me a section, and the surrounding tissue, of a bicuspid taken from one of the San Quentin inmates, in which normal appearing pericementum with the principal fibers with the ends embedded in cementum had formed in an area which he said was formerly a pocket and which had been treated. The fact that alveolar bone will occasionally build in farther than the former depth of pocket would seem to permit, as shown in x-ray films, is another indication that re-formation of pericementum at the expense of attaching epithelium may take place.

Just how much we can expect new pericementum to form in areas where periodontal pockets formerly existed is a problem for the future. At present, it is satisfactory if pockets can be reattached with epithelium so as to obliterate the pocket without gingival recession. Efforts to remove the lining epithelium so as to eliminate a barrier to connective tissue reattachment are in my opinion impractical. The sodium sulfide treatment of the pocket lining as advocated by McCall and the New York University dental school actually destroys and removes only a fraction of the epithelium in the pocket but does increase the depth of the pocket as shown by Beube. His evidence indicates that reattachment is less after the use of sodium sulfide than

where it has not been used. Reattachment by epithelium is so satisfactory in its practical effects for the patient that, until experimental evidence indicates a proved method for assuring restoration of pericementum, it is better not to injure the epithelial lining, but rather to promote its reattachment.

There are many places where reattachment cannot be made to occur. Outside of the possibility that all subgingival calculus was not removed, there are cases wherein the mechanical shape of the root does not favor a binding of the surrounding tissues against the root tight enough to permit reattachment. This is particularly true in roots which are longitudinally grooved or in multirooted teeth when the bifurcation is detached. The tightening of healing connective tissue fibers tends, in these cases, to leave a space between the surrounding tissue and the groove or bifurcation in the root, thus preventing reattachment. However, since one is happily surprised at times by reattachment occurring where it was hardly expected, the operator is justified in doing everything possible to promote it.

There are a few cases in which Vincent's infection seems to play a part in deep periodontal pockets. In these, the pockets are painful on instrumentation and are very slow in healing. A slight exudate will continue to form, keeping the pockets open and preventing reattachment. The use of 10 per cent arsphenamine in glycerine introduced deep into the pockets has seemed to further recovery in a few of my cases.

If, by every means at our disposal, it is found impossible to obtain a tight dense periodontal tissue all about each root, which the patient can maintain in a reasonably sanitary condition, it is time to consider removal of the infected tissue by one of the surgical technics. There are certainly cases in which it is necessary to give access for cleaning exposed tooth surfaces that could not otherwise be kept free from bacterial accumulation. There are cases wherein, for one reason or another, the patient cannot do his part in home massage, and the results of conservative treatment are therefore unsatisfactory. There may be cases in which it is necessary to get rid of periodontal infection quickly because of its general health implications regardless of the possible bad effects in the mouth. Certainly surgical resection is to be preferred to total extraction in these cases.

My plea is not against surgery, but rather that surgical measures be used as a last resort instead of as routine treatment. There is no reason why dentists should not acquire the technic of conservative periodontal treatment, so that most cases can be treated adequately by them, just as they acquire the technic of other branches of dentistry. The result of restoring the covering tissues of the teeth to health and thereby saving them is so much more satisfactory than the result of surgical removal of these covering tissues that there should be no choice to one who has the best interests of his patients at heart.

It must be admitted that cases treated by the conservative method require follow-up treatment at least twice a year. Reattached epithelium or tissue merely hugging the tooth tightly without reattachment is more liable to subsequent rapid infection and breakdown than that which has a normal pericementum attachment under the marginal gingiva. Some bacterial growth and salivary deposit will escape with the best of home care and a careful check-up and cleaning and polishing by the dentist are necessary at sufficiently frequent intervals to prevent recurring penetrating infection with reopening of the pockets. If the home care is adequate, twice a year is sufficient for this. If the patient is liable to become neglectful, it may be necessary to make the intervals shorter. If the patient is so situated that

he cannot have such follow-up treatments by a dentist competent to give them, the prognosis for conservative treatment may be unfavorable, and a treatment which removes vulnerable tissue may be the indicated procedure. There are difficulties to be surmounted in the way of conservative treatment, and if, for any reason, these cannot be surmounted, so that health may be gained and maintained, and if the teeth can be preserved in health by gingival resection, this, in most instances, is to be preferred to extraction of the teeth.

One important reason why many dentists have had a discouraging experience with conservative treatment apart from lack of skill in the technic is that they are not trained to diagnose the local causes of periodontal injury. A tooth which is shifting or moving excessively to and fro in its socket has a periodontal attachment which is injured, with its connective tissues in a transitional stage and its vascular system unstable. In this condition, it is susceptible to infective invasion and, if already infected, cannot be cured by conservative treatment until the tooth is stabilized. Stabilization does not necessarily mean ligating or splinting to hold the tooth immobile, but rather so reconstructing the dentition that further shifting is impossible and the affected tooth is supported against a to-and-fro movement.

The causes of shifting of teeth are manifold, but undoubtedly the most important is loss of molar support resulting from loss of the lower first molar. The effects of this loss have been told over and over, and yet we see patients who have been getting regular dental care for years and who have teeth loose and shifted, with deep periodontal pockets due to loss of a lower first molar, which the attending dentist has never advised replacing.

Contrary to generally held opinion, mesiodistal to-and-fro movement of the tooth in its socket is a more frequent cause of periodontoclasia than lateral movement. Careful exploration of pockets will convince any one that proximal pockets are more frequent than buccal, labial or lingual pockets. While many proximal pockets are caused by faulty sanitation in the interproximal areas starting with subgingival calculus in childhood or by attacks of Vincent's infection at one time or another, a great many are caused by mesiodistal to-and-fro movement of the tooth in its socket due to lack of proximal support. The interproximal bone is seldom so well developed to withstand to-and-fro stress as the buccal and lingual process, because the teeth normally are supported by each other against such stress. When the support of an adjacent tooth is lost, owing to extraction, shifting, approximal caries or insufficient contouring of restorations or from any other condition, the force of occlusal pressure causes a to-and-fro mesiodistal motion in excess of physiologic limits. The fibers are stretched on the side from which the tooth is pushed, while the pericementum and alveolar wall are compressed on the other side. The compression side soon shows withdrawal of alveolar bone, a thickened pericementum remaining. If the tooth were shifting straight away as in orthodontic movement, a compensatory growing in of new bone would take place on the suspension side; but this is impossible, since the tooth root does not remain in a new position, but springs back as soon as the occlusal force is withdrawn. The result is a series of degenerative and vascular changes on both the compression and the suspension sides that open the way to rapid and deep bacterial invasion with destruction of the periodontal attaching tissues and bone. The condition is, of course, aggravated, if food is impacted and retained in the interproximal area on either side.

While shifting is a most frequent cause of periodontoclasia, it may not be so well recognized that periodontal in-

flammation may cause shifting. When the overbite is so great that the lower anterior incisors practically touch the gingivae lingually to the upper teeth, it frequently happens that the upper teeth start to shift into a protrusive position. This may be because the occlusal force of the lower teeth against the lingual surfaces of the upper creates a forward thrust that causes destruction of the alveolar bone on the labial surfaces of the upper teeth. The upper protrusive shift may occur on a tooth which is not in contact with the lower teeth at all. In this case, it will often be found that a periodontal pocket exists on the lingual side of the protruding tooth, the pressure of the inflammatory elements of which is acting like an orthodontic pressure to shift the tooth out of line. The pocket, in turn, has been caused by food impaction under the lingual gingiva from the force of the lower anterior teeth. When the tissues are treated by conservative means to eliminate the pocket and get the gingival tissues so firm that food can no longer become impacted, the protruded tooth, provided there is still space for it, will shift back into alinement.

Perhaps the most baffling type of mobility is that of the posterior teeth when there has been no shifting nor loss of approximal support. The to-and-fro movement in this case is buccolingual with periodontal pockets developing on the buccal and lingual sides. Many of these cases can be explained by a patient's habit of gnashing the teeth during the day or night. No doubt these bad habits would be harmless, except for occlusal wear, if the alveolar bone were heavily developed, as in the Eskimo, by vigorous masticatory use during the life time. But in persons of frail alveolar support, any such wracking lateral movement as that caused by these habits is sufficient to bring pressure on the surrounding alveolar walls and cause resorption. As the bone recedes and the pericementum becomes thicker, the movement caused by the habit increases in extent until the teeth become noticeably mobile and periodontoclasia supervenes.

No definite treatment can be suggested here for these bad habits unless the patient is able to break himself of them, once they are thoroughly discussed. Grinding at all points of occlusal contact is decidedly not the way to treat the occlusal surfaces. Judicious reshaping of occlusal surfaces to reduce the areas of occlusal contact, increase sluiceways and remove points which interfere with free lateral excursions will help, but extensive grinding of occlusal surfaces, the so-called occlusal equilibration, often brings a train of evils far greater than the ones at which it was aimed. When the periodontal tissues are treated and brought back to a more healthful condition, the pernicious occlusal habit sometimes disappears. Possibly a slight periodontal inflammation due to insanitation was responsible for the habit developing as a reflex in the first place, but once the habit started, it added an aggravating factor more potent than the insanitation.

SUMMARY

The conservative treatment of periodontoclasia is based on the fact that when causes of the disease about the periodontium are removed and the tissues brought back to health by massage, the covering and supporting tissues of the teeth can be maintained in health indefinitely with little if any gingival recession. Under favorable conditions, reattachment of the epithelium lining the pocket to the root surface obliterates the pocket entirely. Follow-up care is more essential to maintain an extensive gingival covering tissue in health, with the pericementum far from the margin, than when the pericemental fibers start immediately beneath the marginal gingiva. In an effort to rid tissues deep beneath the surface of infection, it may tax the ingenuity to devise massage technics

which will reach the depths of the flabby tissues. Any excess to-and-fro movement of the tooth will aggravate infection of the periodontal tissues and tend to delay healing. The diagnosis and treatment of conditions which cause shifting of the teeth or a to-and-fro movement are essential to satisfactory treatment.

630 West 168th Street.

FADS IN PERIODONTAL TREATMENT THAT HAVE PASSED INTO DISUSE AND FUNDAMENTALS FOR SUCCESSFUL TREATMENT THAT REMAIN

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DURING the last quarter of a century, there have been many fads in the treatment of periodontal disease. These modes of treatment have been extensively used, but many of them are now in disuse.

Cataphoresis, which was for a while employed widely as a therapeutic agent in the treatment of periodontal disease, was a process whereby drugs were supposedly introduced or forced into the gingival crevice and deeper approximating tissues by means of an electric current or an electric osmosis. This method failed because there are no drugs, no matter in what manner administered, which will cure or prevent periodontal disease. Cataphoresis may, however, be used successfully in other diseases.

Of more recent use was ultraviolet ray therapy. Many claims of wonderful cures were made, and through a high-pressure sales campaign by the manufacturers, many dentists were led to purchase these expensive machines. It has been proved by competent investigators that very little can be accomplished by the use of ultraviolet ray therapy unless accompanied by local periodontal treatment.

Vaccine therapy, at one time quite popular, was abandoned because it did not prove satisfactory, probably owing to the fact that the bacteria in the pockets are of many types and we do not know which ones are most involved. Local immunization is still claimed by some to be of value.

Recently, many have used some of the escharotic acids for the destruction of the diseased periodontal tissues, and for obliteration of the resulting pockets. However, the action of acids cannot be confined to the diseased tissue alone. They destroy a great amount of healthy tissue as well, causing severe postoperative pain and having other serious sequelae. Their general use has almost ceased.

The Pycopé treatment caught the fancy of many. This was a treatment whereby a patented medicated solution was introduced into the pockets by means of specially made wooden sticks. The ineffectiveness of the treatment again points to the fact that there are no drugs that will prevent or cure periodontal disease, although as far back as we have any record, and to the present day, dentists and physicians have continually

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tried in vain to effect a cure for periodontal disease by the use of substances of almost every known kind, from urine to emetine chloride.

The emetine chloride[1] treatment was used by dentists and physicians on the theory that *Endamoeba buccalis,* found in periodontal pockets, was responsible for the disease and that the use of emetine chloride would destroy the organism, thereby effecting a cure. Results failed to substantiate this theory; consequently, it has been discarded.

For a while, many thought that traumatic occlusion was the chief etiologic factor in periodontal disease, depending on its correction as the chief therapeutic measure. Now it is generally recognized to be only a contributing cause in some cases, an effect in others, and in still others a negative factor. However, cause or effect, if traumatic occlusion is present, it must be corrected if repair of the periodontium of the affected tooth or teeth is to take place.

The Dunlop treatment was widely used, but has passed into general disuse, mainly because the extravagant therapeutic claims made for it could not be verified routinely. However, the oxygen spray is an effective therapeutic aid in periodontal treatment, especially in Vincent's infection and ischemia, aiding in local tissue metabolism and replenishing the partially depleted oxygen tension of these affected areas. It also may destroy or render ineffective bacteria that have worked deep into the tissues. The local hyperemia will certainly aid the cells of inflammation in cleaning up the destroyed tissues and in carrying away the waste products. I have used the oxygen as an aid in periodontal treatment for fourteen years with gratifying results and have found it to be very effective in treating Vincent's infection. In Vienna in the summer of 1937, I learned that Gottlieb and Orban had had the same experience.

At the present time, the spectacular electrocoagulation method is catching the fancy of many, mainly owing to the extensive advertising by the manufacturers of the machines used in this treatment. This method, like many others, may have some merit, but, in my opinion, it will gradually fall into disuse because it will not give the results claimed for it.

In reviewing the various methods that have been proved almost worthless, I wish to point out that a number of them have served as stepping stones to a greater light on the successful treatment of periodontal disease. It is also my aim to show the general practitioners, especially the younger ones, the danger of adopting these "sure cures" and finally having to return to the fundamental principles as originally laid down by Riggs,[2] the founder of modern periodontal treatment.

Riggs lectured extensively both in this country and in Europe, and his fundamental principles have been almost universally accepted. He depended on careful and thorough subgingival curettage and employed surgical measures to eliminate the hopelessly diseased soft tissues. He depended on mouth hygiene to maintain the health of the remaining oral tissues affected by this treatment, and he claimed that at least 90 per cent of all cases could be cured by these methods. However, he asserted that periodontal tissue which was destroyed by inflammation was gone, never to be restored. He administered no medicaments whatever, either local or general, and vigorously condemned their use.

For a long time, there have been two different schools of periodontists, the conservative and the radical. The conservative claim to be able to cure or control periodontal disease by careful subgingival curettage and other routine measures, and hold that surgical procedures of any kind should never be resorted to. The radical group hold that operation is always indicated and rely on it as their basic therapeutic measure.

However, there has been, I believe, a

gradual acceptance by both schools of the fact that each has a place in the treatment of periodontal disease. Today, conservative and surgical treatments are being used in the same mouth with great success. The more radical type of operation on both the soft tissues and the underlying bone is gradually falling into disuse. Gottlieb[3] states that radical operation on the bone is to be condemned because it prevents bone regeneration.

There are several types or manifestations of periodontal disease, each type seeming to require deviation from a routine technic of treatment. Yet there are some fundamentals for successful treatment, whatever the type may be.

An early diagnosis makes the prognosis of all periodontal disease more favorable and simplifies the treatment. Good roentgenograms are a valuable aid in the early diagnosis of any disturbance in the periondontium, in that they enable the periodontist to detect hidden changes before they are noticeable clinically, and to determine more definitely the extent of tissue destruction. This may make possible the arrest of these morbid changes and repair of the tissues before irreparable damage has taken place.

All hopelessly diseased teeth should be removed; for example, teeth that can be moved up and down in their sockets; teeth in which the bifurcation or trifurcation of multirooted teeth is involved or there is not sufficient bone left to hold them firmly in their normal places in the arch, and, usually, those teeth which cannot be made to function. It is very difficult to completely eradicate periodontal infection involving either the trifurcation of upper molars or the bifurcation of lower molars and upper bicuspids, and if it is not entirely eliminated, it may act as a focus of infection and cause disturbances in other parts of the body. Sometimes, an attempt can be made to save a seemingly "hopeless" tooth if the cooperation of the patient is assured and if the patient demands it. Devitalized teeth do not present a favorable prognosis, although some clinicians claim that loose teeth become more firm after devitalization. Sometimes, successful attempts have been made to save one or two roots of a multirooted tooth, if only one root is involved, by devitalizing the tooth and resecting the exfoliated root.

A thorough understanding by the patient of the nature of periodontal disease and his responsibility in establishing and maintaining periodontal health is essential. He must be made to realize that the structures which hold the teeth in place are diseased, that these diseased areas must be eradicated and that it is impossible to check the progress of the disease and maintain restored health of the supporting structures unless he learns the correct use of the toothbrush and practices it persistently. The daily cleaning of the teeth and stimulation of the periodontium will raise their resistance. If this prophylactic measure is not employed from beginning to end, the treatment and control of periodontal disease will be a failure because one of the main etiologic factors will not have been removed. If oral health is established, but later oral hygiene is neglected, the disease will return. Unfortunately for the host, one attack of periodontal disease does not immunize against another attack. Periodontal disease, unlike many other diseases that attack the human body, never cures itself or "gets well" without some form of therapeutic aid, while some other disease, as serious or even more so, will run its course, and a natural cure be brought about without therapeutic measures.

One of the fundamentals of successful periodontal treatment is the elimination of all pockets and their accompanying septic and irritating matter. In the incipient or less advanced cases, this can be best accomplished by subgingival scaling and curettage. For scaling, several different types of instruments are used, such

as hooks, files and blades, and for polishing, rubber cups, strips and pumice. I find Towner planes and McCall curettes to be the instruments of choice in subgingival curettage. Metaphen applied in a 1-200 solution in alcohol and acetone, or a 10 per cent aqueous solution of arsphenamine, pumped into the gingival crevices with a Young rubber cup which is attached to a handle, is a great aid in controlling bacteria and will rapidly eliminate them as an active irritant. This should be done before subgingival curettage or gingivectomy.

In dealing with the more advanced pockets in the anterior area, I have found the Kirkland[4] flap operation to be best. In this conservative surgical procedure, direct access is had to the pocket, and, through better visibility, it is possible for the operator to remove all of the diseased tissue, thoroughly clean the exposed root surfaces and remove the septic matter from the pocket. This type of operation gives the most satisfactory postoperative esthetic results. It is more successful in the anterior area because the teeth are single-rooted and seem to be more amenable to conservative surgical treatment than the posterior, multirooted teeth. Also, this area is more accessible.

For the deeper pockets around the posterior teeth, it is better to employ the Gottlieb-Orban[5] gingivectomy type of surgical elimination of the deep pockets and their accompanying pathologic tissues and irritating matter. This procedure completely removes the pockets. After this operation and proper postoperative treatment, recurrence is less likely. An esthetic postoperative result is of no great concern in these areas.

Normal function of the teeth must be established and maintained, for any disturbance of normal function causes disease. This requires mechanical coordination of the teeth in both jaws in centric occlusion and in the excursive movements of the jaws. In some mouths, in order to accomplish this, careful grinding to equalize occlusal stress may be necessary; in others, partial or complete rebuilding of the occlusal surfaces of the teeth with cast gold or baked porcelain restorations, or a combination of both. All lost teeth except third molars should be replaced and open contacts closed by suitable restorations or by orthodontic treatment. Impacted teeth that have a tendency to force other teeth out of normal position in the arch, with abnormal function resulting, should be removed.

Nutritional deficiencies will impair the health of the periodontium and may lower its resistance. It is imperative that everything be done to establish a balanced nutritional program for every patient suffering from periodontal disease. A medical specialist should be consulted in case of doubt. Vitamin C deficiency, apparently one of the contributing factors in certain cases of periodontal disease, is easily corrected by the addition of sufficient quantities of citrus fruits, raw cabbage and milk to the daily diet. It is important that adequate amounts of milk and other dairy products, meat, whole-grain breads, fresh fruit and vegetables be included in the diet to incorporate in it all vitamins and minerals, as well as proteins.

Excessive use of table salt[6] in the diet feeds the inflammatory processes in periodontal disease, and it is advisable to minimize the use of table salt for this reason.

There is a wide divergence of opinion among past and present-day authorities throughout the world as to the exact etiology of periodontal disease and the form of treatment to be employed to bring about a cure or control of the various types of periodontal lesions. However, all seem to agree on one fundamental; that is, that oral hygiene forms the most effective preventive treatment of periodontal disease and is one of the absolute necessities for bringing about its cure and maintaining cure or control. Oral hygiene must be accomplished by

the correct and persistent use of good toothbrushes at least twice daily. If there has been extensive loss of the interdental tissue, brushing should be supplemented by the use of polished round wooden toothpicks or a rubber point attached to a handle, such as that devised by Drake, in order to clean more thoroughly the interproximal areas and stimulate the interproximal tissues.

Correct oral hygiene will prevent the accumulation of débris, a periodontal irritant, which furnishes pabulum and affords protection for bacterial growth. Proper stimulation of the periodontium will raise its resistance to invasion by oral micro-organisms, which are ever present, always ready to attack these structures if they become weakened. Moreover, the massage strengthens the gingivae to withstand mechanical irritation. If we are to be successful in periodontal treatment, our patients must be successful in the use of the toothbrush. This cannot be accomplished by the repeated use daily of the same brush, because there are no toothbrush bristles manufactured that will retain enough bristle tone or stiffness, if employed several times daily, to thoroughly remove the débris from the teeth and at the same time stimulate the circulation of their supporting structures. It is necessary to have at least three good brushes, so designed as to allow the average patient to reach all areas that require cleaning and stimulation. The best way to meet this problem is to employ three brushes of the same design and quality having different colored handles, keeping them in a dry drinking glass, handles down and bristles up and placing the glass containing the brushes in an open window during the day, where the sunshine will help revitalize the bristles and diminish bacterial growth. By no means should the brush be kept in a closed container. The patient is instructed to alternate, using the red-handled brush always in the morning, the white-handled brush at noon and the black-handled brush at night. As their usefulness is very short-lived, these brushes should be discarded at the end of each month and new ones procured.

A toothbrush plays very much the same rôle in removing débris from the oral tissues that a razor blade does in removing whiskers from the face. One must have a sharp razor blade to remove whiskers, regardless of the kind or brand of shaving soap applied to the face as an aid. It is equally necessary that the bristles of a toothbrush be stiff enough to remove the débris from the teeth and stimulate the periodontal tissues, regardless of the kind or brand of toothpaste or tooth-powder applied on the brush. It is a fact that most toothbrushes are used very much as a shaving brush is used; that is, they are employed to daub the paste or powder in the oral cavity and around the teeth.

As a result of extensive advertising of the extravagant, fallacious claims made by dentifrice manufacturers, who ignore the paramount rôle of the toothbrush in oral hygiene, we have come to depend on toothpaste or powder to clean the teeth and stimulate the supporting tissues. We are led to believe that the medicaments in these various dentifrices will not only stimulate periodontal tissues, but will also annihilate the oral bacteria. Owing to this misinformation, the public concerns itself with the minor problem of selecting the proper dentifrice, giving little consideration to the much more important problem of selecting properly constructed toothbrushes and becoming proficient in their use. For this reason oral hygiene as practiced by the majority of patients is ineffective and disappointing to both patient and dentist.

TOOTH-BRUSHING TECHNIC

I find very few patients who have really been taught the correct use of the toothbrush, or made to realize the necessity of its persistent and thorough use, although they may have had professional

dental care over a long period of time. Nearly all make a feeble and haphazard attempt to brush the teeth, but few attempt to stimulate the periodontium with the bristles of the brush. Every patient should be taught to follow a definite technic for cleaning the teeth and stimulating the tissues, so as to habitually care for all areas. The importance of periodontal stimulation cannot be minimized. It is believed that the periodontal tissues, in a way, are end-organs.[7] This makes them more liable to circulatory disturbance and therefore more susceptible to congestion.

The best procedure is to begin on the buccal surfaces of the upper right molars with the jaws almost closed, so as to allow the working head of the brush to reach slightly posteriorly to the distal surface of the last remaining molar, employing the Charters method of toothbrush manipulation, or any of the other recognized methods, with suitable deviations to accommodate the individual requirements of the patient's mouth. It requires at least ten strokes to thoroughly clean the buccal surfaces of the molars and the distal surface of the last molar and to stimulate their supporting tissues. After the brushing of the buccal surfaces of the molars is finished, the brush is moved forward to the bicuspids and cuspid, with the minimum of ten strokes; now to the incisor area, then to the left cuspid and bicuspids and then to the left molar area. Now the brush is shifted to the lingual surfaces of the left molars, then to the lingual surfaces of the bicuspids and cuspid, then to the incisors; next to lingual surfaces of the right cuspid and bicuspids, then to the molars; which completes the circle buccolingually around the upper dental arch. Next, the occlusal surfaces of the upper teeth are scrubbed with light vibratory strokes, working the ends of the bristles down into pits and fissures. The upper arch should always be brushed first in order to avoid dislodging débris on the lower.

Now we begin on the buccal surfaces of right lower molars and complete the circle as described for the superior teeth. Next the tongue is pushed as far forward as possible and downward over the chin and scrubbed thoroughly with the bristles of the brush. The tongue accumulates great quantities of débris; which frequently causes bad breath. Finally, the mouth is rinsed with plenty of water, which is forced back and forth between the teeth with the tongue and cheeks. This will dislodge and wash away any remaining loose débris.

The bristles of the brush should be cleaned with rapidly running cold water after each fourth of the mouth is covered.

This technic answers definitely the question frequently asked in dental practice, "Doctor, how long should I brush my teeth?"

The misuse of the toothbrush may do as much harm as good. For example, mechanical abrasion at or near the dentino-enamel junction may result. The gingivae may be injured, recession resulting, leaving the root surfaces of the teeth exposed. This will mar the appearance of the teeth, and the exposed root surfaces may be very sensitive and prone to decay. Improper brushing may also cause the marginal gingivae to roll or have a knotty appearance. Seesaw brushing over a long period of time may cause deep notches in the teeth near the gingival third. This is an irreparable damage and should be avoided by a correct toothbrushing technic.

Only in rare cases is it possible for a patient to learn oral hygiene with the toothbrush at one sitting. It is usually a tedious process and must be repeated many times, requiring great patience and persistence on the part of both patient and teacher. There are usually areas that are neglected. The patient's attention should be called to these and instructions should be given as to how to keep these neglected areas clean and the periodontium stimulated. This procedure must

be resorted to from time to time throughout life if we are to save the patient's teeth and protect his general health.

In the use of the round toothpick, beginning at the buccal aspect in the most posterior interproximal space on the upper right side, we place the point of the pick on the interdental septal tissue and push it well lingually, using a pump stroke; that is, applying and releasing pressure always in the vertical stroke, employing at least six strokes in each interdental space around to the last interdental space on the upper left side, dropping down to the last interproximal space on the lower left side and progressing around to the last interproximal space on the lower right side.

These fundamental therapeutic measures will restore the gingivae to health and bone rebuilding usually takes place. The remaining bone will become more dense; usually a tightening of the teeth in their sockets will follow, and a feeling of well-being will be noted by the patient.

We are expecting colloidal chemistry[7] and endocrinology,[8] that is, modern medical science in cooperation with dental science, to solve the unknown etiology of the types of periodontal disease which make little or no response to recognized periodontal treatment, although the percentage of such cases is very small. In these cases, some general metabolic disturbance may be present, or an improper function of some of the endocrine glands may lead to the periodontal disturbance or make it more severe. Only by thorough and minute medical investigation can such cases be helped, but the local treatment should be carried out without delay. There is still much to be learned about periodontal disease; yet there are adequate therapeutic measures which, properly applied, will control the disease and, if diagnosis is made early enough, will enable the average patient to retain his teeth and their supporting structures in health throughout the normal span of life.

In conclusion, I should like to briefly summarize some of the fundamentals on which I have elaborated in this paper:

1. Complete oral diagnosis.
2. A thorough understanding by the patient of the nature of periodontal disease and his responsibility in establishing and maintaining periodontal health.
3. Elimination of all diseased periodontal tissue and pathologic pockets and their accompanying irritating and septic matter.
4. Restoration of the dentition to normal function as nearly as possible.
5. Correction of any nutritional deficiencies and other general health disturbances.
6. Institution and maintenance of oral hygiene.

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Fifth and Hazel Streets.

DIET AS RELATED TO PERIODONTAL CONDITIONS

By Dorothea F. Radusch, D.D.S., B.A., M.S., Minneapolis, Minn.

NUTRITION in all its phases of food intake, digestion, utilization, elimination and hygienic habits plays an integral part in the physiology of man. So it follows that it has a general as well as a direct influence upon oral health also. Information as to specific dental application of nutrition fundamentals is meager. Some research is being done as regards the caries problem and nutrition, but even less has been done specifically as to periodontal tissue and nutrition.

Various theories have been presented in the literature. There is a suggestion that diet during development of dental structures has an important influence upon future integrity of the tissue. Mellanby's (1930) research upon dogs is the chief evidence for this.

It seems generally considered that nutrition after adolescence is more significant as regards investing tissue conditions. But here there is great conflict of opinion as to the relative importance of the various dietary factors. This conflict may well be due to the very limited research upon this problem. Research to date has touched upon the effects of some of the essential minerals and vitamins, the influence of the alkaline potential of the diet, environmental variations such as salivary composition differences or functional activity of mastication, and lack of a balanced diet.

Research by Hojer and Westin (1925), Howe (1922), Weisberger *et al.* (1938) and others demonstrated the adverse effects of a vitamin-C intake too low to prevent scurvy. Vitamin D experiments with laboratory animals by Mellanby (1930), Becks and Weber (1931), Kronfeld and Barker (1932) and Templin and Steenbock (1933) showed the beneficial effects upon bone structure of vitamin D additions. As there is as yet no established standard or measure of vitamin D requirement for human adults, owing partly to the difficulty of measuring quantitatively the effect of sunlight, there is no standard for determining or estimating adequacy of intake for this class of patient.

The frequently quoted experiments by Bauer, Aub and Albright (1929) showed that bone trabeculae are readily depleted by prolonged negative calcium balance; whereas a long-continued high-calcium diet resulted in rapid accumulation of trabeculae. Jones and Simonton (1928) and Becks and Weber (1931) reported that dogs on low calcium diets showed more extensive bony changes of the jaws than in the general bone system. In addition, experiments by Anderson and associates (1936) indicated that although extraction of molar teeth of rats caused jaw bone changes in both control and experimental animals, such changes were exaggerated in the case of rats on a low inorganic salt diet.

While such research is an important beginning, suggesting as it does a direct connection between certain factors of

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diet and oral health, until scientific progress has produced additional information, dentists must content themselves with the application of the general principles of nutrition. Furthermore, responsibility as a member of a profession providing health service as well as the present educational background and training of the dentist justifies his education of patients in this vital matter. Patients should be instructed as to the necessity for including in their daily diets a sufficient amount of the essential nutrients. Exact amounts of the required intake are not known, but a standard or range of intake has been established, maintenance of which will prevent serious deficiency symptoms, even though greater intake may be considered desirable by some authorities.

According to nutritionists, the diet must contain a satisfactory amount of protein of the proper quality, generally conceded to be 1 gm. per kilogram (per 2.2 pounds) of body weight; 0.68 gm. of calcium, 1.32 gm. of phosphorus, from 8 to 10 mg. of iron for males and from 12 to 18 mg. for females; 0.001 gm. of iodine (requiring a supplementary source such as iodized salt in goiter regions); from 3,000 to 6,000 Sherman units (1,500-4,200 international units) of vitamin A, 30 Sherman-Chase units of vitamin B per hundred calories (750-900 units per day or 250-400 I.U. per day), 600 Bourquin-Sherman units of vitamin G, 30 Sherman units (300-450 I.U., or 15-25 mg. of ascorbic acid) of vitamin C for scurvy prevention, but probably double this amount for protection of the odontoblasts or other nutritive health, and amounts of other vitamins and minerals not so readily estimated, but which are assured by the consumption of natural foodstuffs which have not been devitalized by manufacturing processes. One may obtain these essentials from widely divergent types of foodstuffs; as, for example, in central Europe, vitamin C is obtained predominantly from paprika, in Mexico from peppers and in the United States from citrus fruits and tomatoes.

It is frequently a problem for the dentist to determine whether the patient's diet meets the foregoing standard. Merely discussing food habits or reading over a diet record brought in by the patient may give an erroneous impression as to adequacy. Because of popular advertising and ease of communication and transportation, similar foodstuffs are available to the majority of patients in the United States who seek dental service from private practitioners. For this reason, a simplified scheme for analysis of food intake can be set up, permitting the dentist to estimate a diet list with relative accuracy.

The patient must be asked to cooperate by keeping a careful record of a week's food intake, making specific entry of the kind of vegetable and meat and approximate amounts of such foods as bread, cream, sugar and butter. Unless otherwise specified, it is considered that servings of other foods are average in size. The record must include all foods and drinks consumed at meals and between meals. When only part of a serving is eaten, the amount should be estimated and properly noted. Blank paper seems best for keeping such a record, since printed forms are likely to suggest foods which are not representative of the usual diet. From this master list, the chart for diet analysis may be filled out, a 1 being used for each serving of foodstuff, or $\frac{1}{2}$ or other designation as indicated.

If the average per day for the period equals the standard list of foods, the majority of dietary essentials as given previously in units and grams will be met. This list of foods may supply only from 8 to 10 mg. of iron, which is probably sufficient for men, but too low for women. Therefore, women especially need to take additional care to see that high-iron foods such as liver and the green vegetables are used generously.

Also, since yeast and whole cereals are the best sources of vitamin B, and since supposed "whole-grain or dark" breads customarily contain only a small proportion of this substance, there may be some question as to the sufficiency of vitamin B even when the standard foods are consumed. In spite of such possible shortcomings, this chart will give a graphic picture of the patient's food habits. Observance of the unfilled or overfilled spaces will suggest necessary additions and substitutions.

Protein is supplied by meat, milk, cheese, egg, cereal and high-calorie vegetables such as dried beans, peas and potatoes. Because animal protein contains a better proportion and variety of essential amino-acids, some intake of this is compulsory for good health. If one serving of meat and two of milk and one egg are taken each day, efficient protein will be ample. Naturally, if one of these items is lacking, excess of another may supply the protein necessary.

Unless the diet contains a pint of milk each day, or its equivalent in cheese, it is almost impossible to satisfy the calcium requirement. This is significant because adults commonly omit milk, believing they can meet requirements with fruits and vegetables or even butter or cream. Butter, although a milk product, contains no calcium; whereas 1½ cups of 20 per cent coffee cream is required to equal the calcium in 1 cup of milk. Thus, with one tablespoonful as a liberal average serving of cream per cup of coffee, the amount used in six cups of coffee would supply the calcium equivalent of only one-fourth cup of milk.

The huge amounts of fruits and vegetables necessary to supply calcium would tax the digestive system and make meals uninteresting. It has been estimated that when milk is omitted, calcium requirements can be fulfilled by the intake of at least twenty servings of fruit and vegetables a day, instead of the recommended five servings when milk is included. Dietitians know that even five servings of such foods is more than the average intake. Should we wish to make such a substitute for the pint of milk for one day, we would find it necessary to eat, for example:

	Equivalent in Calcium Content to
6 medium-sized oranges	1 cup of milk
1 cup of green peas	⅛ cup of milk
3-4 medium-sized potatoes	¼ cup of milk
6 medium-sized apples	⅛ cup of milk
¾ head lettuce	¼ cup of milk
1 cup of diced carrots	¼ cup of milk
Total	2 cups of milk

This substitution would be not only exceedingly bulky, but also very expensive. These foods would cost probably from 50 to 75 cents, depending on the season and the locality, in contrast to 5½ to 7 cents for the pint of milk, which would cost, as quoted in May 1938, 11 cents a quart in Minneapolis and Seattle, 12 cents in New Orleans and Butte, 13 cents in Rochester and San Francisco, and 14 cents in Richmond. If it is purchased by the pint, prices are generally somewhat higher, and yet the milk is still by far the most economical source of calcium, besides supplying other important factors. It is to be understood that vegetables and fruits have an important place in the diet, but not as calcium sources. In addition, it is very possible that with such huge intakes of fibrous foods, digestion and absorption of minerals and vitamins would be disturbed. Recent reports by Kramer and Gillum (1938) emphasize the fact that ordinary meals contain enough calcium for the adult only when they include liberal amounts of milk.

Phosphorus is supplied mainly by protein foods, and since the economic influence of the cost of meats has brought a change from three to one serving of meat a day as typical of American dietaries, unless a liberal supply of other protein foods is included, there will be a serious lack of phosphorus.

Meat, eggs, fruits, vegetables and whole grain cereals supply iron. From research reviewed by Dickson (1937) and Minot (1937), it is apparent that iron is a pertinent problem for women. It is suggested by some of the workers in the field that from 16 to 20 mg. daily is the only safe amount for women; whereas the numerous diet surveys show that diets seldom contain 12 mg. In a study by Weddowson and McCance (1936), it was found that addition of large doses of iron salts raised the hemoglobin level of women in every case; whereas it scarcely altered the hemoglobin percentage of men. Apparently, the lower hemoglobin levels of normal women considered satisfactory by most physicians are due to their lower iron intakes and their higher requirements. Possibly sex should not determine the standard for judgment. Rose has estimated that 3,000 Sherman units of vitamin A (1,500-4,200 I.U.) will permit a margin of safety for adults. An analysis by the Bureau of Home Economics resulted in their tentative use of 6,000 Sherman units as adequate. Vitamin A is supplied by milk, egg yolk, butter, cream and yellow and green fruits and vegetables. The average amount of butter used on a slice of bread figured by the chart method as one serving, and the average serving of coffee cream, supply approximately the same number of vitamin A units.

Tishler's (1929) report from Boston on diets in cases of periodontal disease showed sixty-five out of ninety-six with an intake of less than 3,000 Sherman units; while a survey of 184 cases at the University of Minnesota including some clinically healthy as well as varying degrees of periodontal involvement showed 107 with less than 3,000 Sherman units intake. This deficiency might be interpreted as a factor in the production of the disease except for the fact that correlation between degree of disease and intake was so low as to be almost negligible. It is suggested, then, that al-

CHART FOR DIET ANALYSIS*

Standard Adult Day	Food	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	Average
1 serving	Meat								
1 pint (2 cups)	Milk, cheese								
1	Egg								
6 servings	Butter, cream								
1 serving	Fruit (high vitamin C)								
1 serving	Fruit (other)								
1 serving	Vegetable (uncooked)								
1 serving	Vegetable (cooked)								
1 serving	Potato								
2-3 servings	Cereal foods (dark)								
2-3 servings	Cereal foods (white)								
	Sugar								
	Vitamin supplements								

*Mark 1 for each average serving of each food in the proper space

though vitamin A is known to have a specific influence on epithelial tissue, there is as yet no evidence of the direct importance of vitamin A or of the actual amount necessary to influence periodontal tissues.

Thirty Sherman units (300-450 I.U. or from 15 to 25 mg. of ascorbic acid) of vitamin C has been repeatedly estimated as sufficing for scurvy prevention. This is the amount, for example, in one-half medium-size orange, one-fourth grapefruit and two medium-size cooked potatoes. It is readily seen, then, that when potatoes were eaten two or three times a day, scurvy was prevented; while just half the average serving of citrus fruit is ample to prevent scurvy. Tishler found that seven out of ninety-six patients, most of whom had serious tissue involvement, had less than 30 units intake; whereas only sixteen out of the 184 University of Minnesota subjects had less than 30 units, with one-half taking more than 60 units. It has been demonstrated that probably sixty units is necessary to prevent odontoblastic disturbance and possibly disturbance of other tissues of the body. Since there was no significant correlation between vitamin C intake and the degree of involvement of the investing tissue as observed clinically and by the x-rays in these 280 patients, almost all of whom had a scurvy-preventive intake of 30 units or more, it does not seem logical to consider that periodontal lesions are symptoms of scurvy in the average case coming to the dental office. This does not mean that we should eliminate consideration of this element entirely, yet we should not expect to bring about arrest of disease by giving generous quantities of vitamin C to patients who complain of no systemic ill-health and who are consuming 30 units per day.

Vitamin C deficiency may be more common in patients with a history of systemic disease, particularly in those requiring certain types of special diets, as for stomach ulcers, colitis and allergy, where classes of foodstuffs containing this vitamin are commonly omitted for long periods of time. In a study on vitamin C reported by Weisberger and associates (1938), the patients had been referred for medical examination and the authors reported that low intake of vitamin C was commonly associated with the above-mentioned special conditions. Forty-seven of sixty-five patients had blood concentration of less than 1 mg. per cent and were adjudged to have an inadequate vitamin C intake. Of the eighteen others, two showed obvious loss of bony support. Fifteen patients with initial blood concentration below 0.72 per cent were studied on the basis of response to administration of vitamin C. All showed clinical improvement. "Following the withdrawal of synthetic vitamin C, all but three patients could be satisfactorily maintained by adding two ounces of orange juice to their diet. The three exceptions were patients with colitis in whom normal blood values and clinical improvement were difficult to maintain when synthetic vitamin C was withdrawn." This is another evidence of the small amount of food source of vitamin C necessary to maintain the requirement. The fact that dogs who synthesize their own vitamin C or who have only a relatively small dietary requirement have so-called periodontal lesions further suggests that some factor or factors other than vitamin C are commonly more significant.

Cereal foods include all bread, rice, macaroni, cake, pie crust and crackers, as well as breakfast cereals. The white or refined cereals and sugar supply calories mainly. Sugar is computed as one serving per teaspoonful, two for cake, two for plain ice cream, etc. The main value of the record of the refined cereal and sugar groups is to indicate caloric intake. Patients up to standard weight or overweight may have charts showing many blank spaces in the lower calorie

milk, egg, fruit and vegetable groups, but very high in cereal and sugar.

The question as to whether a diet should be potentially alkaline or acid is not clear from the standpoint of general nutrition, although there are some indications favoring a balanced intake of acid-forming and base-forming elements. Nor is there any very conclusive evidence concerning such potentiality as regards periodontal health. Although the beneficial effects of a potential alkaline diet are most commonly cited, the explanation of its value may be only that such a diet, being one predominantly of fruits, vegetables and milk, is more likely to contain generous amounts of minerals and vitamins, particularly calcium. The latter has been shown to have a positive correlation with investing tissue health.

If the estimated average intake of foods per day as figured from the record equals the standard as now recognized, one can conclude that, at the time the diet list was made, the intake was probably satisfactory; whereupon, when periodontal disease is present, one must consider the possibility of differences in metabolism, vitamin D activity and the length of time that the patient has been on the present type of diet. If there had been a previous lack, structural changes may have taken place within the tissues, which mere replacement of the factors cannot be expected to correct entirely.

When the intake is low, a surplus amount of certain elements, particularly calcium, phosphorus and vitamin D, is recommended, because it is desired to replace the lost bone trabeculae. It is frequently advisable, when adding a pint of milk to adult diets in order to bring the daily calcium intake up to standard, to suggest additional use of a compound such as 1 or 2 teaspoonfuls of dicalcium phosphate to facilitate storage of minerals. Research, including that by Adams, Boothby and Snell (1936), suggests that high calcium retention on a soluble salt such as calcium lactate cannot be maintained on a limited supply of phosphorus, and that either additional food containing large amounts of phosphate or supplementation with a phosphate preparation is advisable. Scriver and Venning (1934), by balance studies, showed retention of phosphorus actually decreased when calcium gluconate was given, but increased when dietary calcium was used, which also added extra phosphorus. Many physicians have prescribed calcium lactate or gluconate on the assumption that patients receive plenty of phosphorus and are lacking only the element calcium. On the contrary, surveys show actually fewer patients consuming standard amounts of phosphorus than of calcium, especially in the case of women, who tend as a class to eat less meat. It seems wisest then, since the periodontist wishes to influence bone, to prescribe both elements necessary for such storage.

Vitamin D must always be given with the preparations of calcium and phosphorus to bring about proper utilization, and probably is best also with milk additions, especially in areas of limited sunshine and for patients who do not have ample opportunity for sun irradiation. Very few patients who have been unaccustomed to drinking milk can take more than two or three glasses a day, which makes supplements advisable. When it can be taken, milk is of course the best source of nutritive elements, the vitamin D milks being particularly so for periodontal patients. Patients must be cautioned that unless the half-pint bottles of milk are used, assuring a full cup of milk per serving, the ordinary glass or cup when filled to the usual level will hold only two-thirds to three-fourths cup. Therefore, two glasses of milk are commonly only one and one-third or one and one-half measuring cupfuls instead of the supposed pint. This may cause a real discrepancy in evaluation.

Sometimes, there is difficulty in persuading patients to include milk in the

diet. Often, they complain that they do not like the taste of milk, or they may object because of its supposed "fattening properties." Actually, the calories in one cup of whole milk are comparable to those in any one of the following items: one slice of bread and butter, or one-half milk chocolate bar 6¼ by 3 by 3/16 inch, a very small piece of unfrosted cake 1¾ by 1½ by 1¼ inches, a scant half cup of plain vanilla ice cream, three plain sugar cookies and one-half piece of apple pie (1/12 of a 9 inch pie). All of these are common items of diet, yet supply very little other than calories. Omission of any one will prevent weight increase due to inclusion of one cup of milk, while omission of an ice cream sundae, piece of pie or piece of luscious frosted cake would permit addition of the entire pint of milk. With a little determination, it is not difficult to make satisfactory adjustments. Skim milk or buttermilk, both of lower caloric value, or cheese may be used to supply the calcium, but not cottage cheese, the mode of preparation permitting most of the calcium to pass into the whey. A cube of American cream cheese 1 by 1½ by 1 inch will equal in calcium one cup of milk, but with two-thirds of the calories. The various cheese spreads, because of mode of preparation and method of use, are not such good calcium sources.

Since milk will supply more of the essential dietary elements which are commonly lacking in the average diet, there is a great temptation to consider only this foodstuff when estimating the adequacy of the diet and when making suggestions. Although a positive relationship has been shown in the case of groups of patients exercising free choice of diet between food-calcium consumption and degree of periodontal tissue health, this does not as yet permit prediction in each individual case. Therefore, each patient must be considered separately to determine whether there is satisfactory intake of all commonly recognized dietary essentials from sources not so highly refined as to eliminate some as yet unestablished factors. When food needs are supplied by liberal use of a variety of natural foodstuffs, there is little occasion to become concerned about the presence or absence of the numerous factors which are required in more or less minute amounts. Only on limited diets or when too great a proportion of refined energy foods are consumed need special attention be paid to the trace elements.

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USE OF THE OCCLUSOSCOPE

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THE practical value of research in dentistry cannot better be illustrated than by the marked improvement in the teaching methods at most of the dental schools in this country during the last decade.

In prosthetic dentistry, the tireless efforts of innumerable men, who, at a considerable sacrifice of time, are striving to to get a better understanding of the biologic and biomechanical problems encountered in denture construction, need more than a passing notice, especially if we bear in mind that not a single dollar has been contributed by research foundations to prosthetic research, although more than $1,000,000 has, from time to time, been given for dental research within the past twenty years.

I do not mean to imply that this money given for other dental research has not been a valuable asset to dental education. The studies made in oral histology, oral pathology, biochemistry and bacteriology have been directly responsible for a sizable house-cleaning in operative dentistry. Many of the empiric notions and processes of the past have been discarded, some have stood the test of scientific analysis and have been retained and many new concepts have been accepted, especially in the field of oral diagnosis.

What the results would be if a systematic and well-planned program of dental research was instituted, on aspects of dentistry common to all its branches, is not difficult to imagine.

The biologic problems involved in stabilizing an artificially constructed occlusion, as in prosthetic dentistry, of stabilizing an artificially corrected occlusion, as in orthodontia, or of correcting the effects of dysfunction manifesting themselves in the form of periodontal lesions, as in periodontia, are of such vital importance that the present comprehension we have of them is inadequate to serve as a basis for thorough diagnosis and outline of treatment.

The aim of all clinical dentistry as the maintenance of the teeth and related structures in a state of functional efficiency, normal development and health is generally accepted. That a knowledge of the teeth and the pathology of their investing and associated tissues alone is not sufficient to fulfil all of its aims is recognized. Were mechanical methods alone adequate to supply lost teeth, restore normal masticatory function and aid in the normal development of the human

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jaws and face, there would be no obvious need for a background of research to ascertain the causes of dysfunction.

Dental literature abounds in traditions and speculations which, by constant repetition or modified reiteration, have assumed the position of truth. We have had too much speculation, which, "though it may anticipate discovery, can never be substituted for inquiry." This, of course, does little harm, provided it does not propound old fallacies as truths. On the other hand, it seems to create a feeling of satisfaction and security in the *status quo,* and makes us indifferent to further inquiry, either because we honestly feel no good will come of it, or perhaps in apprehension that our traditions may become undermined. It would be unfair to say that our theories and traditions have been taken out of thin air. Some are based on observations by conscientious and capable men who have spent a lifetime in gathering facts. Others have failed, not because of any lack of sincerity or intellectual honesty on their part, but a lack of scientific completeness in their accumulation of facts and experimentally determined data.

The immediate field of all dental operations is the masticatory apparatus. We are continually faced with faulty development of one or more elements of this apparatus. It is one of the greatest sources of our clinical problems; and yet dentistry as a science has not endeavored to uncover the laws governing the normal functioning and development of this apparatus, despite the certainty that such knowledge is essential to the comprehension and treatment of dental dysfunction. Little is known of the functional relationship of the various parts of the masticatory apparatus.

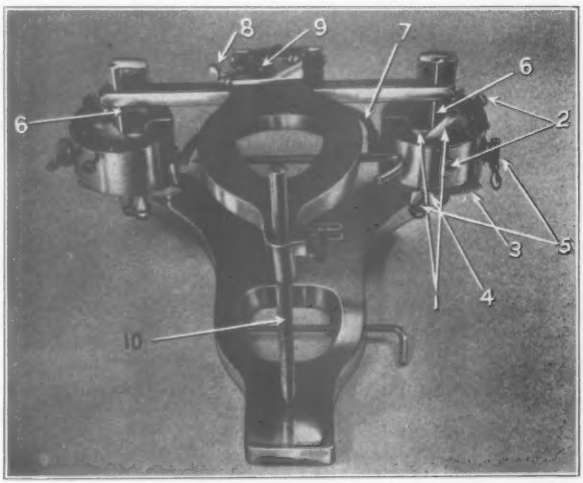

Fig. 1.—Centric position. The condyle pins, 6, 6, are at the apex of the gothic arch forming blades, 1. The two adjustable units are seen on each side supporting condyle pins, 6. Within these units are located the glenoid fossa disks, which are partly hidden by the arch-forming blades.

The formation of a rational and scientifically conceived system of dentistry, a system based essentially on information gathered from experimentally determined data, is the dream of every thinking dentist. But the evolution of such a system has long been delayed, on the one hand, by the prevailing mechanical concept of

dentistry, wherein the ultimate expression of clinical practice rests with ingenious mechanical devices, skilful manipulation of materials and mechanically achieved esthetic results; and, on the other hand, by the ultrabiologic trend manifested in the medicodental literature, with little or nothing done to fill the gap between these two extremes.

Furthermore, this condition is, I believe, responsible for the anomalous situation in which graduates of dental schools find themselves now, after four years of study in medical and dental subjects; namely, of being equipped with unprecedented training in technical skill to restore masticatory function, without basic scientific information regarding the very functions that they must correct.

Admittedly, there is a large body of knowledge pertaining to the mouth, teeth and jaws, gathered in large part from medical and biologic sources, that has been adopted and is made use of in dental and oral therapy; but there is remarkably little known of the functional relationships of the various parts of the masticatory apparatus.

Let me give an example from one unexplored field in dental research. Extensive research has been carried on in gross and minute anatomy of the teeth, yet we know nothing of the changes that may take place in the structure of the teeth as a result of (1) complete lack of masticatory function, (2) partial masticatory function and (3) full and vigorous masticatory function. Medicine has discovered the existence of certain laws governing the reaction of bone to stress, load and pressure. The discovery of these laws has been of great value in orthopedics. Is it not, then, within the province of dentistry to find out whether similar laws exist which may govern the reaction of the tooth structure and its supporting tissues to masticatory stress?

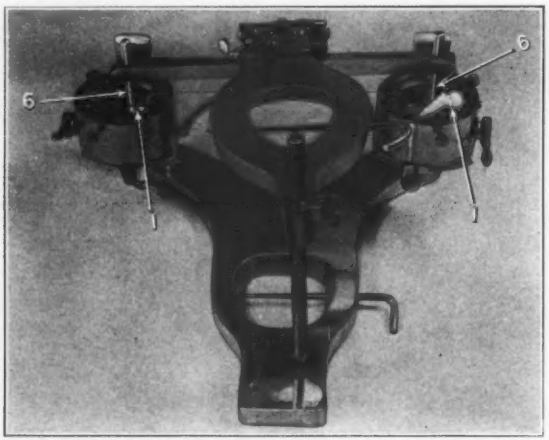

Fig. 2.—Right lateral position of mandible. To the right, the condyle pin, 6, is in balancing position. The condyle pin, 6, on the left is in working position.

I venture to state that it is not within the realm of Utopia to assume that studies and research in biomechanics may disclose that a goodly number of the manifestations of oral disease which are now considered as primary invasions and are treated as such are in fact merely sequels to dysfunction; and if dysfunction can be recognized and corrected, a measure of immunity may be provided against certain forms of dental disease, even though

a background of susceptibility or predisposition to them may exist, in much the same manner in which preventive measures in medicine have succeeded in immunizing the susceptible.

Until the time arrives when research along these lines will provide us with basic information and added knowledge, we shall have to be content with whatever fragmentary information we can gather from here and there, based on the collective efforts of men composing the membership of our and other similar groups and societies.

My main purpose is to present and describe the occlusoscope, which is the embodiment of sound engineering principles as applied to biomechanical problems encountered in dealing with the occlusion of human teeth. In its design, every effort has been made to adhere strictly to anatomic findings and their correlation with tracings of mandibular movements, all of which are fully accounted for.

From study of the anatomy of the jaws, we derive the information that the mandible hangs loosely from the temporal bones; that it may be pulled in any direction by the tension of certain muscles, and that "it swings not with its center at the condyles, but at the points where opposing muscle forces meet and balance."

That this is substantially correct is fully supported by tracings of the masticatory movements of man. If we analyze these movements, we find that they fall into two distinct classes:

1. General masticatory movements of indeterminate character in that they are not reenacted along the same path with any degree of precision. In these movements, the teeth appear to be used for their tactile sense in determining the character of the food and the method of its reduction, etc.

2. Rhythmic masticatory movements of definite character, which are always executed along the same path with great precision. During these movements, the teeth seem to passively carry on the reduction of food.

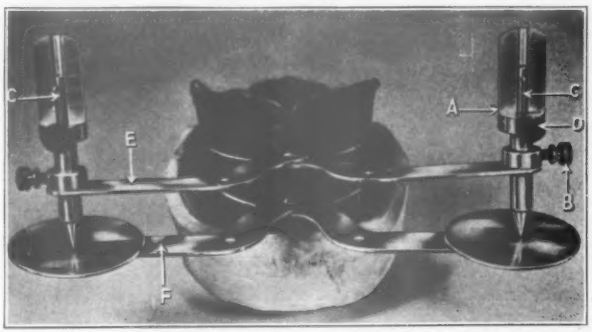

Fig. 3.—Centric position of trial-plates with graphic recorder for extra-oral method. The upper end of the plungers C, C are at zero on the dial of tracing units A. Screw B tightens the units in the frame E. Screw D tightens plunger C.

Both of these are compound movements in three dimensions. It further appears that the rhythmic masticatory movements are possible when the upper and lower teeth are in a state of harmonious interdigitation, but not necessarily normal as occlusion is commonly classified. Lacking harmonious interdigitation, it appears that only vertical movements can be substituted for them, eliminating to a large extent the grinding element. Apparently, the substitution for rhythmic mastication of only vertical movements of the mandible is in all probability responsible for the behavior of the

teeth and their supporting structures manifested in one phase of a dental pathologic process termed traumatic occlusion.

The anatomic structures involved in rhythmic mastication appear to be the external pterygoid muscles and the menisci, as the guiding factors, and the internal pterygoid and masseter, as the power factors. Whether the temporal muscle plays an important part in rhythmic mastication other than as an accessory to these is not known. From the meager knowledge that we have of the masseter, it seems to be the main power factor in the noncentric positions of the mandible.

development of the arches and under what conditions they are most effective, and also whether, with the loss of all the permanent teeth, their effect on rhythmic mastication with artificial dentures becomes a source of interference that might necessitate a new approach to denture problems, such as the selection of denture teeth.

To speak frankly, the crusades instituted against cusped teeth in virtuous indignation regarding the destruction of the maxillary and mandibular ridges have not reduced their loss, nor has the reduction of the cusp heights added many years to their life. I have found that one has to spend as much time to properly adjust

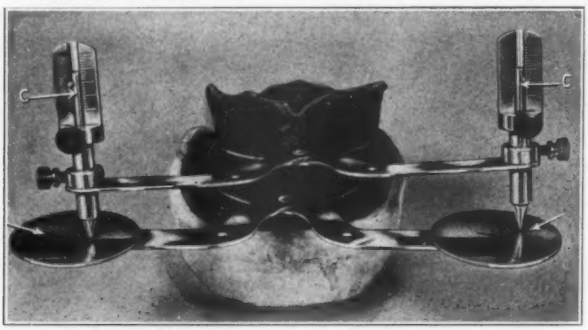

Fig. 4.—Right lateral position of mandible. Plunger C has remained stationary at zero, on the right hand side. The plunger on the left side has traveled three graduations above zero. The arrows point to the lines marking the point at which the readings have been taken.

The obvious dual function of the external pterygoid muscles, in that, through their attachment to the menisci, they open the jaw amply to more than clear the elevation of the cusps and, through their attachment to the condylar fossa, direct the interdigitation of the teeth, serves as one illustration of the highly specialized character of these muscles.

That the external pterygoid muscles in synchronous action with the other muscles play an important part in the development of the arches cannot be seriously disputed; but very little as yet is known of the exact manner in which they influence the arch, and at what state of the

and balance cuspless teeth, in order to reduce trauma (one of the several causes of resorption), as he did before with the advent of cusped teeth.

I am convinced that both the new and the old designs of denture teeth have made no appreciable difference in tissue resorption, because the dynamic composite curves described by the mandible for the working and balancing elements of mastication have refused to conform to either a 4 or a 5 inch radius, or to any other scheme of articulation which is foreign to their nature.

By far the majority of technics for the balancing of dentures stress the descend-

ing condyle path as the only element in the mandibular movements worth considering. These technics ignore the true working element, which is not the resultant of the right and left balancing elements, but is entirely an independent element. The working element is a dynamic factor; the balancing element is not. The working side carries the whole of the masticatory pressure needed in mastication; the balancing element on the other side acts only as a shock absorber.

The few technics in which the working element is recognized defeat their own purpose by introducing an element entirely foreign to the masticatory apparatus, and that is an incisal guidance equal in the steepness of its inclination to the condylar path. An incisal guide pin in an instrument is intended to prevent closure of the bite during construction: it is not a third temporomandibular joint.

Every adjustable part of the occlusoscope has its counterpart in the human masticatory apparatus, and, when properly adjusted, it will reproduce all the mandibular movements during mastication, barring only those slight variations from straight lines which arise from the yielding nature of the tissues at the joints.

The base of the occlusoscope carries two adjustable units, representing the two temporomandibular joints, which guide its upper or movable arm. The upper arm can be readily removed and replaced, and thus the manipulation of the instrument is extremely simple.

Within each adjustable unit is a circular disk which represents the floor of the glenoid fossa. The disk can be tilted forward and back, and also from side to side. Tilted in two inclinations each having a different degree of angulation, these disks represent the two distinct inclinations found in the concavity of the glenoid fossa: the working inclination in a laterally tilted position, and the balancing inclination in the anteroposterior tilted position.

Each adjustable unit also carries two gothic arch forming blades. If we were to analyze the factors in the tracings of a gothic arch, we would find that they are traced by the contraction of the external pterygoid muscles as they move the mandible from centric to right and left

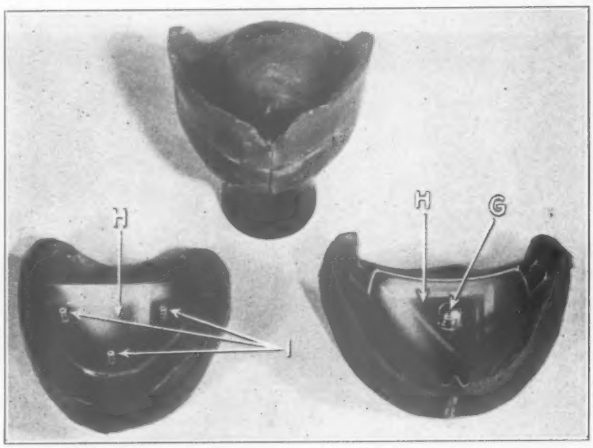

Fig. 5.—Above, original trial-plate on which esthetic landmarks and occlusal plane have been established. This is put aside for the set-up. Below, left, second upper trial-plate with recorder cup attached. Below, right, lower recorder cup with central bearing. The plastic path tracing pins are marked I.

lateral positions. Two gothic arch tracings, made one on each side of the face, are but enlargements of two similar gothic arch tracings within the joints, and they represent the principal elements of rhythmic mastication mentioned previously.

The gothic arch forming blades guide the upper arm along the path of the muscle pull of the pterygoids. The variations which commonly occur between the two temporomandibular joints in every individual can thus be faithfully reproduced.

It is an accepted fact that harmonious interdigitation of the cusps of the teeth in a natural dentition is a result of the arrangement of the natural teeth and their cusps, parallel to the muscle pull responsible for the lateral movements of the mandible. Teeth that may fall in the path of these muscle forces will gradually become rotated or displaced, and their supporting tissues will become traumatized in direct proportion to the susceptibility of the individual to trauma. Similarly, in the case of full artificial dentures with either cusped or cuspless teeth, the most important stabilizing factor is the harmonious arrangement and milling of the teeth to the muscle forces of lateral mastication.

It is true that actual interdigitation does not exist in cuspless teeth; but just as, in the cusped teeth, the actual direction of lateral forces makes for harmonious interdigitation, so, with the cuspless teeth, the direction of the lateral forces increases or decreases the radius of the arcs of the composite curves, especially if the working inclination of one glenoid fossa is not a continuation of the arc of the balancing inclination of the opposite glenoid fossa, which it never is.

The upper or movable arm of the occlusoscope has two vertical pins, which rest on the condylar disks. These represent the two condyles. The upper arm is provided with a hinge which is operated by releasing a latch (No. 8) in Figure 1 and lifting the arm upward. When the arm is lowered, the latch will lock automatically. There is also a provision to lock this latch with a screw (No. 9). This permits the upper arm, when guided with the guide pin, to bend at the hinge joint, allowing the condyles to tilt backward on the condyle disks, and providing any amount of retrusion needed when milling the teeth after the dentures are cured.

For full denture construction, the occlusoscope can be accurately adjusted

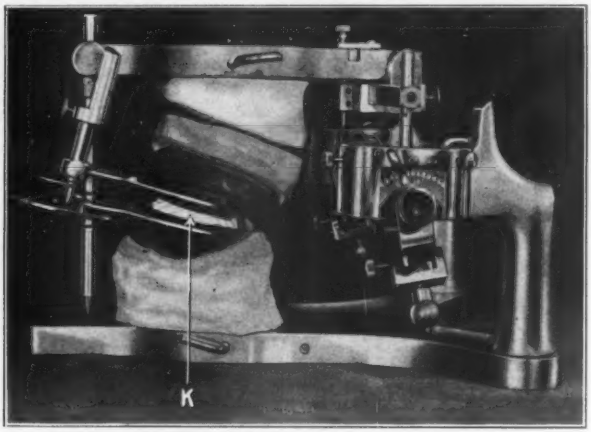

Fig. 6.—Plaster wafer K holding trial-plates together.

either by extra-oral records or intra-oral methods. For orthodontia, partial denture prosthesis and crown and bridge work, it can be adjusted by the use of check bites or locking molds or by reproducing the contact points of the teeth as seen in the mouth in forward and lateral positions.

The mounting of the casts on the occlusoscope is done in the usual manner, without the need of the facebow. It will be advantageous, however, to mount the heels of the casts from 10 to 15 degrees below the incisal level.

EXTRA-ORAL METHOD

1. Prepare the trial plates with either vulcanite or some other hard base material, using modeling compound or hard wax for the rims.

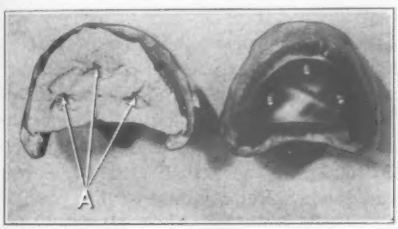

Fig. 7.—Intra-oral records.

2. Trim and adjust in the mouth, establishing a good arbitrary centric relation, and mount.

3. Put aside the upper trial plate for the setup and make a new upper trial plate for the records. (Upper picture, Fig. 5.)

4. Cut away evenly about one-eighth inch from the lower occlusal rim, and attach the lower recorder cup. Repeat for the upper trial plate, using the upper recorder cup.

5. Raise the central bearing to bring the trial plates to the original bite level on the instrument held by the guidepin.

6. Attach the upper and lower recorder frames to their corresponding trial plates by heating their prongs.

7. Blacken the lower frame disks over a candle flame and transfer to the mouth.

8. Fasten plungers C with screws D at zero on the dial of the tracing unit A. Insert these in position in the upper frame, the points of the plungers touching the blackened disks, and tighten screws B.

9. Release screws D and instruct the patient to repeat several right, left and forward movements of the mandible, until two good gothic arches are obtained. Have patient hold the mandible at the apex of the gothic arches. By having the patient retrace the tracings, the readings of the working and balancing positions are taken. The readings should be taken at the extreme point of unstrained lateral positions. The point from which they are taken should be clearly marked with a line. (Arrows, Fig. 4.)

10. Request the patient to return the jaws to centric position. Lock the indicators. The blackened disks should be shellacked to prevent them from becoming blotched in handling.

11. Securely wax the lower trial plate to the lower cast on the instrument, oil the central bearing and cover with a little soft plaster of Paris.

12. Press the upper trial plate on the plaster, resting the plunger points at the apex of the arches. The plaster provides a positive lock between the two recorder cups for mounting.

13. Wax the upper cast to its trial plate and remount. (Fig. 6.)

ADJUSTING TO EXTRA-ORAL METHOD

1. Place the condylar disks in a horizontal position.

2. Remove the guidepin and release screws D of the tracing units.

3. Slide the upper arm to the right so that each tracing point of the plungers retraces its corresponding tracing on the blackened disk. (Fig. 4.)

4. Bring the inner blade on the left side, and the outer blade on the right side in contact with the condyle pins, and tighten. (Fig. 2.)

5. Repeat for the left position.

6. Slide the upper arm to the right so that the right tracing point stops at the line indicated by the arrow. (Fig. 4.)

7. In order to reproduce the working position reading plus 3 on the left, tilt the condylar disk on the right anteroposteriorly until the plunger reaches three graduations above zero on the dial, and tighten.

8. To reproduce the balancing position reading zero on the right blackened disk, tilt the condylar disk on the left side laterally, until the right plunger reaches zero, and tighten.

9. Repeat for the opposite side.

10. Remove the recorder frame and recorder cups and replace the guidepin. Use the original upper trial-plate for the setup.

INTRA-ORAL METHOD

For the intra-oral method, the preliminary steps up to and including Step 5 of the extra-oral method are the same.

Fill the cup around the central bearing with plastogum, truplastic or fast-setting impression plaster and cover it with a piece of cellophane softened in warm water. Instruct the patient to close and move the mandible to the right, left and forward for several minutes, until the material has set. Remove from the mouth and strip off the cellophane.

To remount, place the upper trial plate with its pins at the apex of the plastic gothic arches of the lower, and wax securely.

With the aid of the plastic gothic arches obtained, the instrument is set in much the same way as with the extra-oral method. Care should be taken not to raise the condylar disks beyond a light contact only with the condyle pins.

After the casts have been mounted and adjustments made, the bite may be safely opened or closed without the loss of occlusal relations. This is a controversial point. But if we bear in mind that, in the adjustment of the instrument, we have accounted for every anatomic element of the temporomandibular joint, this useful feature follows as a natural sequence. One trial should convince the most doubting Thomas.

It will also be noted that the recorder cups are curved to a 4 inch radius. This design eliminates the danger of the occasional strained relations obtained in the past when flat plates were used instead. The central bearing should be depended on to hold the jaws at the predetermined occlusal level, and not as a cusp-height determining factor. The cusp height should be determined from the character of the soft tissues, the ridges and the amount of stability that the impression method used has provided.

The graduations on the instrument are for resetting the instrument in the event more than one case is carried through at the same time. They have no geometric meaning in relation to the bony curvature of the glenoid fossa as seen in the dry skulls. The compressibility of the meniscus, its motility and its uneven thickness make the actual direction of movement far different from that resulting if the condyle were guided by the bony walls of the fossa.

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ETHICS, THE SOUL OF DENTISTRY (IV)

By J. Wright Beach, D.D.S., Buffalo, N. Y.

IT is axiomatic that our training in ethics begins at mother's knee and is halted only by the advent of the Grim Reaper. Therefore, to approach ideals in our profession, the prospective entrant may advisedly seek an understanding of the rules and precepts which govern our special requirements. Let us, then, devote this article to consideration of the fundamentals relating to pre-student and to student guidance throughout the tutelage for service in our special domain. If we, as teachers, adequately fulfil our mission, we may confidently anticipate conscientious adherence to ethical standards of deportment by our graduates, thereby giving to the world sterling supporters of our richest tenets; for an ethical student shall beget an ethical practitioner.

With assurance that our personal concepts are gaged by high ideals and discretionary judgment, we would, doubtless, admonish the prospective entrant to our profession that his first objective relates to evaluation of the basic principles upon which its historic structure rests. To the impressionable neophyte, such counsel from a representative member of our profession is of paramount significance.

Access to current journals and to well-selected treatises from a dental library will acquaint the beginner with the scope of the subjects involved, also the history, activities and achievements of our predecessors; all of which must engender respect and profound consideration for their ardent service and contribution to dental science. It is also a definite fact that first impressions, particularly in early life, are prone to be strangely persistent, and it behooves the prospective dentist to sedulously guard those which may be of future value to him.

Selection of a school having been made, the student will do well to proceed slowly in his choice of associates. The best fraternity available should be sought, even at a sacrifice, for every cultural medium will leave its refining imprint for all time. Intimate associates also convey to one another definite characteristics of lasting import; therefore, to safeguard this ingress is of major importance.

That part of the freshman's training which touches upon morale, character building and deportment may well be stressed early in his course, with the purpose of limiting ulterior influences. This may be accomplished by a short course in ethics early in the freshman year. Much, also, may be gained by following this procedure during each succeeding year.

By early establishment of the ethical sense as a permanent entity in the mind of the first-year student and further by incorporation of the ideal of the perfect tooth as the unit of perfection and beauty, the beginner in dentistry is safely launched upon a career of undoubted usefulness to mankind and honor to his calling.

Years of observation forces one to the conclusion that those members of the student body who fail to advance to the higher levels of deportment are circumscribed by limited appreciation of ethical

usages; or, perchance, visions of future financial gains may befog the perspective. The higher levels of our profession are seldom given the opportunity to welcome one whose visibility is so constricted. Only the vitalizing aspirations actuated by devotion to a great cause are comparable to the reward accruing from a well-earned reputation. Whosoever would arrive by another route shall find the approach safely guarded by invincible and changeless edicts.

While that great basic process of evolvement known as experience is throbbing its way through the veins of the youthful student, it marks a period of challenge to meet each crisis with balanced judgment. Here must be met the competition of values; the analysis of potentials; the relativity of standards. Each student should think his problems through to logical conclusion before seeking counsel, for every victory won begets strength to win another. He is training himself to excel in a special field of endeavor where self-analysis is a precursor of self-reliance.

Perhaps a most constructive attitude of mind for the dental student to cultivate early in his vocational training is recognition that excellence of service is paramount to future financial returns. Case histories have proved that the dentist who "fills teeth with his reputation" has ever been rewarded by commensurate returns in the "coin of the realm," plus the loyalty of his patients. While we would not stress too pointedly the keen satisfaction that a seasoned practitioner experiences in later life from a well-earned reputation, it, notwithstanding, behooves the beginner to look well to the future and to early lay the foundation for a superstructure worthy of his best efforts.

We of the older school whose unflagging efforts have united with those of our confrères in strengthening the fibers and expanding the scope of our beloved profession bequeath this heritage to the youth of our nation, with a silent prayer that our spirit shall live on to protect unborn millions from the exploitation of lowered standards of practice or the octopus of financial greed which plainly marks the route to socialized dentistry. In the spirit of "Service Above Self," the zealous guardians of dentistry have placed us in the front-line defense to preserve our heritage by combating unethical acts and innovations antagonistic to the life and usefulness of our profession.

Because of the dark cloud of socialized servitude now hovering over our heads, we have deemed it advisable to survey the initial weakness in our educational program—prestudent and student direction and surveillance. Individually speaking, have we been true dental fathers to our protégés? Have we faithfully pursued "follow-up" guidance, or have we, with professional self-sufficiency, made the timorous aspirant the bearer of a letter of introduction to our respected dean, and thenceforth relegated the incident to the "lost or strayed" cells of the memory? We cannot forgive ourselves for such infraction, and we contritely pledge ourselves against recurrence of similar injustice to each confiding youth. Our duty carries through until the strong arms of the American Dental Association have been thrown about him. In this wise, we shall render impotent every adverse agency and, in converse ratio, an adamant barrier will have been established—a pledge of service to future dentists.

The American Dental Association Junior Membership plan is a most constructive and practical step forward in behalf of the dental student. Complete cooperation by the profession is an assured fact. To extend the privilege of receiving THE JOURNAL to the first-year student might prove of value, for the first year of student life is the period of determination in many instances. Choice of habits, favorable or otherwise,

are made early in student life; therefore, the initial period is prone to be the most vulnerable of the entire course.

Another thought may be advanced as of possible consideration: Fraternities could join monthly in a review of the current issue of THE JOURNAL, either by an undergraduate or a member of the respective faculty. This plan would aid in establishing a desire for our best periodical literature as well as exert a cultural influence. We should endeavor to forward this program of the Membership Committee in every way.

This vital problem presents many avenues of approach, each of which should be surveyed and given relative significance. If unanimity of effort is secured, the prospect of favorable results will be greatly augmented. The strength of unity is absolute in all major crises; therefore, let us demonstrate solidarity of purpose and so hasten the time when the subject of these articles may be correctly transposed into "Dentistry, the Soul of Ethics."

As a tribute to the faith and enthusiasm of the pioneers of dental journalism of one hundred years ago, may the readers of THE JOURNAL unite as one man to foster the spirit of that noble band whose valor and unflagging energy laid the cornerstone for the Temple of Dental Ethics that we are building today.

333 Linwood Avenue.

EARLY RECOGNITION OF JAW CYSTS: A PLEA FOR NECESSARY X-RAY STUDIES

By G. VICTOR BOYKO, M.S., D.D.S., Paterson, N. J.

MEDICAL and dental teaching has, in the past, stressed the value of prevention and early diagnosis in the treatment of local and systemic disease. Prevention means little or no disease; early diagnosis points to a good prognosis, while delay in diagnosis and in treatment results in suffering, deformity and a high mortality.

With reference to jaw conditions, considerable stress has been placed on prevention and early diagnosis of malignant lesions involving the oral cavity; and with good results. The local and systemic causes of dental caries have been studied with a view to prevention and early care of the disease. Again, the results have been beneficial. In the last decade, one has observed only an occasional leutic jaw lesion and even fewer symptoms of tuberculosis about the mouth.

Nevertheless, in proportion to the decrease in the lesions mentioned, there appears to be an increase in the various types of cystic conditions about the jaws. I am referring now to the variety of extensive jaw cysts, epithelial and non-epithelial, involving multiple teeth and resulting in loss of considerable bony tissue.

It is important to note that, like other lesions resulting from chronic irritation or long-standing infection, these jaw cysts started as small incipient areas of disease; that the growth has been painless and slow, but limitless, and that each cystic lesion could have been either prevented or detected in the early stages of growth.

Read at the Twentieth Annual Meeting of the American Society of Oral Surgeons and Exodontists, St. Louis, Mo., October 22, 1938.

It is a fact that not all cysts have been due to the patient's ignorance or neglect to follow the advice of a physician or a dentist.

The diagnostic symptoms of jaw cysts are not always difficult to detect. It may be necessary to distinguish a traumatic cyst from an ameloblastoma, and, in turn, from a giant-cell tumor or follicular cyst of the jaw; but, regardless of the type of cyst, once the diagnosis has been established, the operative procedures for the treatment are nearly alike. Surgery, in conjunction with deep x-ray and radium therapy, rules in nearly all cases.

It is a demonstrable fact that each cyst presents an incipient stage of growth easily detected by x-ray examination. In the majority of instances, the roentgenogram is the only means of diagnosis. Adequate roentgenographic study includes intra-oral dental films in addition to intra-oral occlusal bite films and extra-oral plate films. Furthermore, a complete examination means the inclusion of not only the alveolar process proper, but also the deeper structures, such as the sinuses, nasal chambers and the mandibular rami, as revealed by lateral and anterior-posterior views.

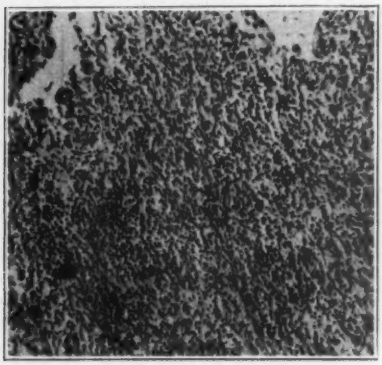

Fig. 1.—Section from typical periapical granuloma, showing absence of epithelium.

It will be the purpose of this discussion to evaluate the means of prevention and early diagnosis of cystic conditions involving the jaws. If the value of these principles has been established, their application may be a worthy effort. Furthermore, it may be important to mention the methods of making an early diagnosis. It may be in order here to mention that a child at 2 years of age is not too young, nor is an adult at 73 too old, for roentgenographic studies as an adjunct to physical examinations.

DENTOPERIOSTEAL CYST

The most common jaw cyst is the dentoperiosteal type, known popularly as the radiculodental or dental root or radicular cyst. A fully developed cyst wall, in this group, consists of the outer fibrous layer and inner layer of epithelial lining. The epithelial cell layer is believed to be due to irritation of the paradental epithelial cell-rests of Malassez, found normally in the alveolodental periosteum.

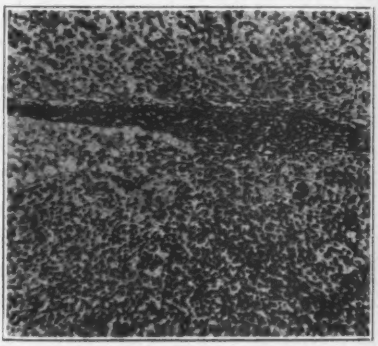

Fig. 2.—Section showing incipient formation of epithelial tissue in so-called epithelial granuloma or early cystic growth.

The dentoperiosteal cyst is invariably associated with the death of a tooth pulp and periapical granuloma, which may be considered as the forerunner of the cyst. Every dental granuloma containing these epithelial cell-rests is a potential cyst, but not all granulomata contain them. Therefore, the periapical granuloma possessing epithelial cell-rests may be con-

sidered the intermediate stage between the average granuloma and the fully developed cyst. This is important because it explains why certain periapical granulomata will heal without surgical interference, while others, unless enucleated, will go on to complete cystic growth. Figure 1 shows a histopathologic section of the periapical granuloma, minus any epithelium. Figure 2 is a histopathologic section of a so-called epithelial granuloma or incipient cyst. Figure 3 illustrates a histopathologic section of a fully developed cyst wall. The distinguishing roentgenologic symptoms of periapical granuloma, so-called epithelial granuloma or

Fig. 3.—Section showing fully developed cyst wall of dentoperiosteal cystic growth. The narrow epithelial lining is in contrast to the thick fibrous tissue layer.

incipient cyst and fully developed cyst are noted only by the size of the radiolucent area. Figure 4 reveals a clinical epithelial granuloma or incipient cyst, as diagnosed from the characteristic size of the area.

METHODS REVEALING THE EARLY DETECTION OF DENTOPERIOSTEAL CYSTS

I. *Death of Tooth Pulp Associated with Deep Filling Restorations.* — Not infrequently, a pulp closely approximating a filling may become congested, with subsequent death from many known causes. The presence of this tooth bearing a dead pulp may then result in periapical irritation by infection and a potential granulomatous growth as a forerunner of the fully developed cyst. Furthermore, this same tooth may not show subjective or objective symptoms and, on casual dental examination, may escape detection. Again, the presence of this innocent-looking tooth with an excellent filling may now result in a potential cyst growing to great size before symptoms of discomfort or swelling compel the patient to seek relief. It is logical and essential, therefore, to request roentgenograms routinely at intervals of two or three years as a means of postfilling examination of each tooth with fillings adjacent to

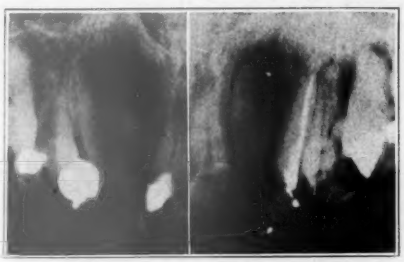

Fig. 4.—Typical epithelial granulomata or incipient dentoperiosteal cysts.

the pulp. Figure 5 shows the innocent-looking tooth with a dead pulp under a filling and the resulting cystic growth.

II. *Death of Pulp, with Periapical Disease Resulting from Untreated Caries.*— Roentgenograms are essential preliminaries to devitalization of teeth in addition to a routine periodic examination of all pulpless teeth. Yet, even today, many dentists undertake the treatment of root canals without the aid of x-ray studies. In such instances, treating a root canal bearing an unrecognized periapical epithelial granuloma or a fully developed cyst may be a hopeless task. In like manner, every pulpless tooth should be roentgenographed as a routine periodic study every

two or three years. This applies particularly to the group of patients who have been under the care of numerous dentists throughout this and other countries; patients, who have been compelled to travel widely by nature of their circumstances or profession.

III. *Death of Pulp Resulting from Trauma Without Subjective or Objective Symptoms.*—Children may have teeth with dead pulps as a result of accidental trauma without immediate symptoms except a mild soreness at the time of injury: a fall from a play swing, injuring an anterior tooth; accidents during play at baseball, and the case of the little girl who takes up sewing and learns to bite the thread between the upper and lower anterior teeth. Trauma to the anterior teeth received in such manner may lead to long standing periapical infection and potential cystic lesions involving considerable tissue before symptoms are noted.

Fig. 5.—Cystic growth arising from dead pulp under filling. No subjective or objective symptoms were evident in this case.

Trauma producing death of pulps and resulting cystic growth occurs not only in children, but also in adults. Football players, prize fighters and persons in automobile accidents receiving head injuries may possess innocent-looking teeth with dead pulps, from trauma and, consequently, potential periapical infection.

It is the duty of every physician and every dentist to suggest and request periodic dental examinations including complete roentgenographic studies associated with each instance of trauma to the jaws. The pulp vitality test is invaluable in diagnosing acute conditions involving the pulp not indicated in a previous roentgenogram. For this reason, an x-ray examination every two or three years is essential in each instance of known trauma to the jaws, for early detection of cystic changes within the bone. Figure 6 shows a cyst resulting from trauma to the teeth in a boy 15 years of age. The history stated that the boy was injured while at play several years previously. A casual examination without x-rays was made at the time of injury. The first symptoms noted just previous to the roentgenographic examination were those of an increasing fulness in the upper left jaw.

Fig. 6.—Dentoperiosteal cyst resulting from trauma to upper jaw in boy aged 15. No x-ray examination had been made at any time since the accident.

IV. *Residual Cystic Lesions.*—Any practitioner with sufficient experience in exodontia and oral surgery is convinced of the necessity of preextraction x-ray studies. A tooth showing only simple caries may be responsible for underlying cystic growths.

An important condition requiring preextraction roentgenograms pertains to the so-termed epithelial granuloma or

incipient cyst and the fully developed cystic lesion. The periapical granuloma, devoid of epithelial cell rests, requires no surgical measures. On the other hand, the epithelial granuloma or complete cyst should be enucleated at the time of tooth extraction in order to avoid a residual cystic growth. The size of the periapical radiolucent area is indicative of the probable size of the cyst requiring enucleation. The operator should give to surgical intervention the benefit of the doubt. If a questionable granulomatous sac is permitted to remain for any reason, a roentgenographic examination should be required within from six weeks to three months for detection of any persisting pathologic condition.

Fig. 7.—Incipient cyst requiring enucleation, as revealed by preextraction study.

A complete roentgenographic examination is required as a preliminary step to any type of restoration. This step becomes more imperative owing to the fact that so much dental work has been done and is being practiced without study roentgenograms. Permitting root apices of teeth to remain in position may result in persisting infection and potential cysts. The pressure of a filling over cystic areas may cause an acute exacerbation of a chronic cystic lesion. Experience has proved that it is false economy to evade the necessary roentgenographic study preceding any dental reconstructive work. Figure 7 reveals incipient cystic growths requiring enucleation as revealed by preextraction roentgenograms. Figure 9 again shows a restoration made without preliminary x-ray study. Figures 8 and 10 illustrate roentgenograms of residual cystic growths.

DENTIGEROUS OR FOLLICULAR CYSTS

The dentigerous or follicular cyst is believed to result from the growth of the cells of the enamel organ prior to eruption of a tooth. The outer wall of the capsule consists of fibrous tissue lined on the inner border with the epithelium and containing an unerupted tooth. Any unerupted tooth acts as a factor in the growth of a follicular type of cyst, but the cuspids and

Fig. 8.—Residual dentoperiosteal cyst of mandible.

third molar teeth with an occasional supernumerary tooth are most commonly involved in these lesions. This type of cyst is completely embedded within the body of the jaw and may reach an enormous size before subjective or objective symptoms lead to discovery.

The unerupted tooth involved in this type of cystic lesion is of the permanent dentition. It is necessary, therefore, to account for all permanent teeth during eruption. The absence of a permanent anterior tooth may be easily detected during a casual examination of the mouth.

The absence of a third molar tooth is less conspicuous and may be responsible for the potential follicular cyst.

At the age of 12 years or before, it is good practice to make a complete roentgenographic examination of the mouth in conjunction with a physical study of the oral cavity. This examination may apply particularly to detection of cystic abnormalities of the dentigerous type. A roentgenographic examination to determine the formation and eruption of the third molar teeth together with potential supernumerary teeth may then be made every three years until their complete eruption has taken place.

The follicular cyst may be found below the apices of the permanent teeth of the mandible and also above, within the ramus. In the maxillae, these cysts have been found simulating the antrum and even closely approximating the orbital cavity. Consequently, in addition to the usual type of dental film, it is essential to include larger films for lateral and anterior-posterior views of both jaws. Also, the occlusal film will aid in proper angulation for detection of these lesions. Figure 11 illustrates a follicular cyst involving an upper third molar and supernumerary tooth. This cystic lesion simulates the antrum, but it actually involves three-fourths of the maxillary sinus. Figure 12 reveals a dentigerous cyst involving an unerupted upper third molar situated high within the maxilla. The patient had symptoms of recurrent trouble of the upper jaw over a period of seven years without detection. An x-ray plate finally revealed the source of trouble. Figure 13 illustrates an extensive follicular cyst of the mandible in a young man 22 years of age. This patient had been under orthodontic treatment over a period of several years before this lesion was detected.

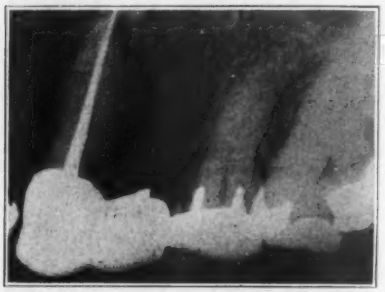

Fig. 9.—Bridge placed in position without preliminary x-ray examination.

AMELOBLASTOMA (ADAMANTINOMA OR MULTILOCULAR CYST)

The adamantinoma, or multilocular cyst, more recently termed the ameloblastoma, is a less commonly occurring cystic type of lesion involving any portion of the mandible or maxillae. This type of neoplasm, which may occur at any age and affect both sexes, appears to arise from epithelial cells having the power to form tissue which histologically simulates the enamel organ. These cystic tumors, which grow slowly and painlessly and reach an enormous size, are the most serious of all jaw cysts because of the persisting recurrence. These growths may consist of solid tissue or be multicystic. The many cystic cavities are lined with epi-

Fig. 10.—Residual cystic mass.

thelial cells and show fibrous tissue with occasional bone forming the septa between the cystic areas. The larger tumors may cause enlargement of the outer and inner plates of the jaws, an objective symptom which may be the first sign of abnormality leading to examination and disclosure. Any form of irritation, such as trauma, infection and systemic disturbances, may be the cause of these growths.

It is important to note that age is no indication of the potential growth. Cases are on record showing that the ages of 2 years and 73 years may be the two extremes affected by these lesions.

The method of diagnosis is again the roentgenogram. An early diagnosis is advantageous because the large ameloblastoma may not be easily differentiated from the giant-cell tumor, large dentigerous cyst or a variation of osteitis fibrosa.

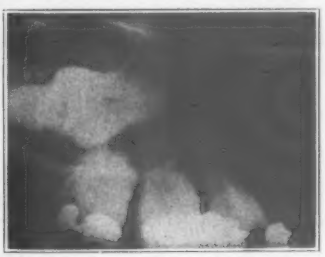

Fig. 11.—Follicular cyst involving upper unerupted third molar and supernumerary tooth. This cyst simulates, but actually involves, the antrum.

Early x-ray examination, therefore, is important in detecting this type of lesion. The age of 6 years or less may be adopted as the age for routine roentgenographic examination in conjunction with the usual physical examination, oral and general, of the child.

HEMORRHAGIC CYST (TRAUMATIC CYST)

More recently, a lesion known as the hemorrhagic or traumatic cyst of the mandible, has been noted and studied thoroughly from clinical, x-ray and histopathologic viewpoints. Symptoms characteristic of this class of lesion, which differs from the usual type of dental cysts, are as follows: 1. No epithelial lining is present, although it has been revealed that a thin fibrous tissue layer may line the cystic cavity. 2. A history of trauma is invariably associated with a lesion. 3. Older children and young adults appear to be the victims. 4. Traumatic cysts simulating the group found involving the mandible have been revealed, involving the long bones of the body. 5. This type of cyst is associated with trauma of a nature insufficient to produce fracture of the bone. 6. The adjacent teeth may be vital without connection with a cystic cavity, but may become secondarily involved.

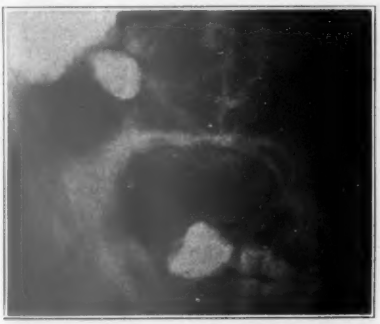

Fig. 12.—Unerupted third molar situated high in cystic cavity. The condition existed for seven years before discovery.

This group of cysts have been described as due to trauma to the jaw producing an intra-osseous hemorrhage and hematoma. Blood stasis results, followed by decomposition producing irritation and subsequent resorption of the trabeculae of the bone spongiosa, and leaving a cavity within the bone proper. This remaining cystic cavity may then increase in size by continued displacement of the bone spongiosa.

Again, the means of diagnosis is the roentgenogram as an adjunct to the history revealing trauma. Every accident

associated with trauma to the jaws should have an immediate and periodic x-ray study over a period of one year. The immediate x-ray examination is probably made in the majority of instances as a routine measure. No immediate changes may be noted in the roentgenograms taken at the time of accident because of the acuteness of the lesion. Nevertheless, x-ray films should be taken after accidents over a period of time necessary for potential bone changes; namely, three months and one year. Continued discomfort in the region of an injured mandible, symptomatic of the traumatic cyst, will suggest the x-ray study.

Fig. 13.—Extensive follicular cyst involving unerupted lower third molar.

Fig. 14.—Extensive ameloblastoma of mandible.

The traumatic cyst will be revealed by the roentgenogram as an irregular radiolucent area with a well-defined outline involving the bone substance in the region of the mandibular canal. The teeth appear to have no connection and may be vital in the early stages. At times, this cyst may simulate a large dentoperiosteal type and may make a preoperative diagnosis difficult in this respect. Nevertheless, the outstanding symptom characteristic of the traumatic cyst is a history of injury. Consequently, a previous history of trauma, plus continued discomfort in the mandible, should be suggestive of a pathologic process and should be followed by x-ray studies of the jaw covering a period of at least one year or longer. Figure 15 shows a cystic condition simulating the traumatic group. The patient was a man aged 23, who also presented a history of injury to this side of the mandible

Fig. 15.—Bone cyst simulating cysts of traumatic group. No tissue lining was demonstrable at the time of operation.

Fig. 16.—Completely healed bone cyst illustrated in Figure 15.

two years previously. At operation, the bone cavity showed no lining whatsoever. Healing took place by gradual granulation tissue formation, with a complete bony regeneration in due time.

Roentgenologically, several groups of jaw lesions present characteristics which simulate those of the average bone cyst involving the mandible and maxillae. Among these lesions are localized osteitis fibrosa, generalized osteitis fibrosa or osteitis fibrosa cystica, giant-cell tumor and malignant invasion of the jaws. The giant-cell tumor and the osteitis-fibrosa lesion frequently simulate the ameloblastoma during its various stages of growth. The difficulty of differential diagnosis increases in proportion to secondary involvement of these lesions by infection. In addition to early and repeated roentgenograms, biopsy examinations are invaluable in order to establish a preoperative diagnosis of these lesions. Figure 17 illustrates a roentgenogram showing a localized osteitis fibrosa. This lesion was discovered in a woman aged 23, during a routine x-ray examination. No subjective or objective symptoms were evident at the time of the examination. A section of the lesion in Figure 17 is shown in Figure 18. This section reveals a connective tissue stroma consisting of fine fibrillae and surrounded or replaced in areas by bone lamellae.

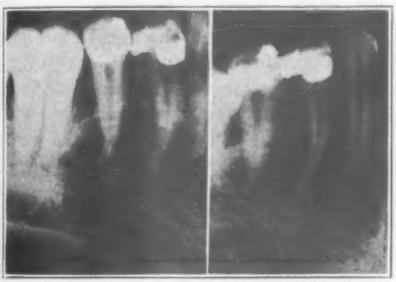

Fig. 17.—Localized osteitis fibrosa revealed by routine x-ray examination.

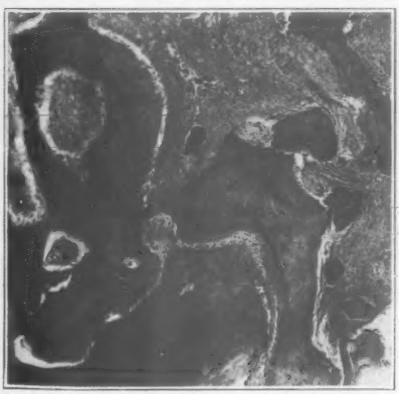

Fig. 18.—Section from lesion in Figure 17, showing connective tissue stroma consisting of fine fibrillae surrounded in certain areas by bone lamellae.

Fig. 19.—Giant-cell tumor of maxilla.

Differential preoperative diagnosis is particularly essential among certain cystic lesions simulating the giant-cell tumor and the area of osteitis fibrosa cystica. This is because some jaw lesions classified as giant-cell tumor and generalized osteitis fibrosa may have a systemic disturbance of the calcium and phosphorus metabolism due to hyperparathyroidism as the underlying cause of the jaw lesion.

Yet, in the early stages of growth of these

various cystic lesions and other types of tumor development, the roentgenogram lends material aid in differential diagnosis, with conclusive results.

Figure 19 shows a giant-cell tumor of the maxilla in a woman aged 36. A bridge had been removed from this area two years previously, because of surface tissue irritation. No follow-up examination was made until the present examination.

SUMMARY

Children are not too young for routine roentgenographic study of the teeth and jaws as an adjunct to dental and physical examination of the oral cavity, at the age of 6 years or earlier. This is important for the purpose of detecting certain potential cystic tumors, such as the ameloblastoma, which may begin growth at any age.

A complete roentgenographic study of the dental arch and jaws consists of intra-oral dental films, extra-oral films and, wherever possible, the occlusal film. A roentgenographic record should be made every two or three years until eruption of all permanent teeth. Observation for unerupted teeth, which may be responsible for dentigerous or follicular cysts, should be made a part of the patient's record.

Trauma to the teeth and jaws resulting from all forms of accident, particularly those which appear of a minor nature, requires periodic roentgenographic studies over a period of time of at least one year following the injury. Attention should be directed particularly to young adults for detection of traumatic or hemorrhagic cystic lesions. Older children who are active in sports should have periodic examination for symptoms of injury to pulps affecting the anterior teeth and resulting from trauma. Such teeth are frequently the source of extensive dentoperiosteal cysts.

Every tooth should be roentgenographed preliminary to devitalization and treatment. A continued periodic x-ray record should be made of all pulpless teeth for potential periapical granulomas and cystic growths. Roentgenographic records, in conjunction with vitality tests of teeth bearing deep-seated fillings, should be maintained over an indefinite period of time.

Preoperative roentgenograms should be studied preliminary to surgical procedures. Every large granuloma, such as the epithelial granuloma, clinically noted, should be enucleated at the time of tooth extraction in order to avoid a persistent cystic growth. Postoperative roentgenographic records following surgical procedures for the elimination of extensive cystic growths should be made over a period of years until complete bone regeneration has taken place. It is further important that every oral examination preliminary to construction of restorations over edentulous areas should include roentgenograms for the detection of any residual cystic growth.

CONCLUSION

Early detection of cystic lesions involving the teeth and jaws by means of routine roentgenographic examination not only aids in differential diagnosis, but also prevents suffering, deformity and even death.

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64 Hamilton Street.

THE PRACTICE OF PERIODONTIA, PAST AND PRESENT

By Raoul H. Blanquie, D.D.S., F.A.C.D., San Francisco, Calif.

WHEN I received my dental degree, more than two decades ago, dental colleges included in their curricula practically nothing regarding diseases of the supporting tissues of the teeth and their treatment. The pathologic manifestations of these degenerative conditions received the most superficial consideration, and the classical treatment did not amount to what would now be considered a thorough prophylaxis. Six G. V. Black scalers comprised the instrumentarium and their limitations were reached in the gross removal of calcareous deposits. The cleaning brush, with an abundance of pumice, concluded the treatment. I do not remember that we were taught any technic in the use of the scalers and, if we had been, it probably would not have made much difference in the results, which, as can be imagined, were most elementary. We just learned like any one trying to instruct himself in the use of a pick and shovel: just pick and dig and something usually happens. Besides, there were no special inducements to treat pyorrhea cases, there being no requirements and hence no credits, and so general interest was directed more toward placing gold-foil fillings and other operative measures.

This attitude toward one of the most devastating of dental diseases, which was general at that time in practically every dental college, remained unchanged for many years. Today, we still find many institutions of dental education far behind in the knowledge of periodontia at present available, thus obliging graduates interested in periodontal problems to seek additional information from outside sources; a sad commentary on those dental colleges that lag behind in periodontia instruction and permit their graduates to go into practice with but a superficial knowledge of one of the most important branches of modern dentistry. Periodontia will never command the consideration that it deserves until uniform and enlightened standards of periodontal instruction are adopted by all colleges of dental education. The basis on which periodontia can justify its right to be considered a major branch of dental practice may be stated as follows:

1. It deals with a most common oral pathologic condition, the gravity of which has been established in that it is a definite potential focus of infection and a factor in systemic diseases.

2. It attempts to safeguard the basal support of the teeth, without which they and any restorative means placed upon them will ultimately fail.

In 1915, during the World's Fair in San Francisco, at the medical congress which was held at that time, Bass and Johns, of Tulane University, startled both the medical and the dental profession by announcing that they had discovered the causative factor in pyorrhea, *Amoeba buccalis,* and were able to demonstrate its presence in exudates

Read before the California Academy of Periodontology, San Francisco, Calif., April 18, 1939.

from pyorrhea pockets. They had also found an amebacide, emetine hydrochloride. Immediately after this announcement, members of both the medical and the dental profession began injecting this drug either intravenously or directly into the lesions; which had a perceptible astringent action on the unsupported soft tissues of the pocket, resulting in a temporary tightening of loose teeth. This method of treatment, however, was rejected when it was demonstrated that the ameba in question was but a harmless scavenger doing more good than harm.

Also in 1915, Frank Billings, of Rush Medical College, gave his famous series of Lane lectures on focal infection at the Stanford Medical School. The belief that infections in one part of the body could have secondary systemic reactions had been prevalent for many centuries, but this investigator brought scientific reports and evidence which marked an important milestone in the progress of medical knowledge. To dentistry, it was no less important, as it emphasized a different outlook on infections of the teeth and contiguous tissues and placed a definite responsibility on our profession for the establishment and maintenance of general health.

About 1917, Arthur D. Black came to San Francisco and gave several demonstrations of his surgical treatment for pyorrhea. His technic involved the removal of detached tissues comprising the pocket with a sharp knife and the trimming of the interproximal process with a fine fissure bur. The teeth, in some cases, became so sensitive that they had to be extracted to alleviate the pain. I do not remember any one who, after Dr. Black's demonstrations, became interested in the method that he advocated. It must be remembered that the credit for originating the principle of the surgical method of treating periodontal pockets cannot be claimed by any known person. Bourdet, who was dentist to the king of France, wrote a textbook in 1757, entitled "Researches and Observations Concerning All the Branches of the Art of Dentistry," in which he described a surgical technic which embodies the principles used today. E. H. Hatton, of Northwestern University, who translated Bourdet's work, told me that he was uncovering records that would probably show that the Egyptians practiced the removal of detached gingivae.

Upon my graduation, I found myself inclined to be interested in periodontia, having been stimulated by what I had heard and seen at the Panama-Pacific Dental Congress during the 1915 world's fair. This wonderful meeting, lasting ten days, acted as a magnet to draw dental authorities from many parts of the world in addition to those of our own country.

About that time, postgraduate work in the Carr system of instrumentation had gained considerable favor in the Bay region, and I joined a class with A. W. Ward as instructor. The Carr system was a scaling procedure which employed 150 scalers of the hoe type and involved a definite technic in the planing of denuded cementum. After one had become somewhat proficient in the technical steps, it was easy to select from the set the correct instrument as it is for a pianist to strike the right note. The results obtained by this method were undoubtedly the most far-reaching possible by instrumentation, as the scalers were so conceived that a pocket of any shape or upon any portion of a single or multirooted tooth could be reached and planed thoroughly. As an adjunct, Dr. Ward gave instruction in his system of polishing the crowns of the teeth to minimize any subsequent irritation around the gingivae which might set up an inflammatory reaction. In passing, I would like to express the opinion that Dr. Ward's polishing technic was probably the most highly developed local

preventive of gingival irritation and also of caries.

Upon completion of the Carr course, one became eligible to membership in the California Academy of Periodontology, which is today one of the oldest study clubs in the United States. In this organization, I had the privilege of watching pioneers in the field of correction of traumatic occlusion such as Leander Van Orden and Frank Pague, its first president. Their work stands as a most valuable contribution to periodontia. Each month, a meeting was held at which the clinicians presented their failures as well as their successes. In the evening, dinner was followed by a discussion of the various cases exhibited during the afternoon. A great deal of good emanated from these meetings, which dealt strictly with practical problems concerning periodontia. As I recall, at no time did any member express the belief that he had obtained a physiologic closing of a periodontal pocket through the process of reattachment. The end-result was considered attained when suppuration had ceased and inflammation disappeared from the soft tissues. Ligating was often employed to give the teeth surgical rest.

Criticism of the Carr method came from the fact that Carr himself was not a dentist. Later, he engaged in a lawsuit with Dr. Hartzell regarding the originality of the instruments that he used. In the controversy, personalities overshadowed the main issue, and the value of the work was greatly impaired. However, the members of this academy remained loyal to Dr. Carr's teachings.

Although every method of instrumentation endeavors to assure the same result, advocates of various types of instruments had their own following. It was not uncommon to see demonstrations or hear papers on the greater merits of one type of scaler over another. So the advocates of the sickle, hoe, chisel, file and curet types of scalers generally had their own individual following. Some also believed that the shape of the handle had an effect on the "feel" of the cutting surface, and made strong claims for their contribution. The problem that also set up separate viewpoints was the perennial question relating to the possibility of reattachment of detached soft tissue to denuded cementum.

In probably no other branch of dental practice were charlatan remedies allowed to make such progress as in periodontia. For many years, patent nostrums, guaranteed to cure pyorrhea, found a ready market in our profession. The greatest factor in discouraging the exploitation of these worthless remedies was the exposure of their contents by the Council on Dental Therapeutics of the American Dental Association.

In the early twenties, Dr. Dunlop, of Chicago, came to San Francisco, and gave a course of instruction in introducing oxygen into the oral mucosa. This procedure had the immediate apparent effect of giving tone and color to these tissues, but was one of those methods of treatment wherein one never knows when the treatment is complete. He also had a paste, of unknown constituents, which was injected into the periodontal pocket, following scaling, and was sealed in position with a preparation containing paraffin. Dr. Dunlop's oxygenation method is still being used in the East.

About 1920, A. W. Ward, of this Academy, devised an original technic employing specially designed instruments to perform the complete surgical eradication of periodontal pockets. At the same time, he introduced a surgical dressing suitable for the protection and desensitization of the exposed areas after the operation. This concise and accurate means of removing all of the infected tissue comprising the periodontal lesion stimulated a new interest in this mode of treatment. It is true that Zentler had previously brought from Germany the

so-called "flap operation," which had been developed by Weski and probably others. While Dr. Ward's method brought hope to many who had not been satisfied with the results that were obtained through instrumentation, it also caused a great deal of indignation from those who believed that they could close the once established pocket, and who looked upon surgical intervention as a procedure causing ruthless destruction of soft tissue. There then emerged two schools of thought within the profession, one termed "radical," the other "conservative."

While men holding these divergent viewpoints were airing the advantages of their respective *modi operandi,* others were striving to evolve a compromise treatment. The principle of none of these can be called original, and they may be classified under the generic term gingivectomy, as each represents a different degree of tissue removal. We have also witnessed the revival of chemical therapies employing various coagulants and escharotic agents to attain tissue destruction. Philip Haley, of this Academy, is responsible, in a large measure, for the renewed interest and refinement of this method, which has gained favor with many who prefer avoiding anesthetics and the use of cutting instruments. In moderately shallow pockets, this method works satisfactorily, but where deep involvement prevails, the procedure becomes long and tedious, and where thick tissues are encountered, it may be considered more or less ineffective. Electrocoagulation is bidding for a place among those methods involving partial or complete removal of the periodontal pocket. Often, with this newer method, the margins of the new gingivae are ragged and not smooth, and, for esthetic and hygienic reasons, the result cannot be considered acceptable.

Many of the younger men in the dental profession find themselves in a quandary regarding the relative merits and possibilities of both the instrumentation and the surgical method. A number of authorities on dental histology and pathology have by their teachings given support to the belief that connective tissue attachment to denuded and devitalized cementum is a biologic possibility, and have thereby encouraged those who believe in its clinical application. Their opinion is based largely upon a purely theoretical conception of tissue manifestation and one which has never been satisfactorily demonstrated either microscopically or clinically. The principal obstacle in the physiologic process of such a tissue reaction is that cementum once denuded and bathed in the infected medium of the pocket becomes an inert tissue and has no power of regeneration. In the union of two tissues, both must be vital. The belief that cementum in the gingival portion, which measures about 1 micron in thickness, can be curetted down to a healthy surface is both a physical and a physiologic impossibility. Kronfeld does not believe that reattachment is possible and, in his textbook on dental histopathology, he has given fundamental reasons for his viewpoint. Balint Orban, Gottlieb's associate for many years in Vienna, and one of the chief proponents of the reattachment theory in the scientific world, has finally reversed his ideas and adopted a realistic point of view. He now advocates and practices that type of gingivectomy which removes detached soft tissue to the bottom of the pocket.

The fact remains that some of those upon whom we, the practicing members of the dental profession, have looked for guidance and enlightenment, owing to their greater knowledge than ours in the basic sciences, have retarded the progress of periodontal treatment by their illusionary ideas. There is no doubt that instrumentation has its place in periodontal treatment and that it possesses great value as an adjunct regardless of the method employed, but it cannot and does not work miracles, no matter who the operator may be. It might be ex-

cusable, to a certain degree, for clinicians in their enthusiasm to mistake a close adaptation for reattachment, but for teachers who are considered scientists to make positive assertions, without producing definite evidence to qualify their statements, cannot be considered a scientific approach to any problem. Science generally does not take a hypothetical question and present it as an accepted fact until it has been thoroughly demonstrated and proved beyond any doubt by all means available.

It is generally conceded by advocates of all schools of thought in periodontal therapy that the objective in local treatment is the disappearance, either through closing or removal, of the pocket. The ideal result is considered attained when a gingival crevice approximates a zero depth. A pocket is known to always constitute an aggravating factor in its further development owing to the nature of its formation. This is principally because the lining epithelium of the lesion cannot be kept in a normal or healthy condition in the presence of irritating elements, which are always present, either loose in the pocket or adherent to the root surface. This renewed activity becomes part of the vicious circle which reestablishes inflammation and suppuration.

Our chief concern in the treatment of periodontal disturbances should be the infection. This thought should supersede all other considerations, even that of the loss of the teeth. As dentists, we are the appointed custodians of the oral cavity and its appendages, and it is our duty to protect the welfare and health of any area within our field of practice from disease and from becoming a menace to general health. This last consideration seems at the present time to have lost some of its meaning. There appears to be a certain laxity and general let-down in certain dental educational centers toward the problems of oral infection such as that emanating from the supporting tissues or from non-vital teeth. This attitude is developing in the face of both laboratory and clinical evidence which has definitely established the fact that infections from oral sources are capable of producing systemic reactions and secondary lesions in different parts of the body.

It is true that, at the present time, we still fail to have at our command any index to determine when and under what conditions a periodontal or apical infection may become an active focus of infection. Nevertheless, we know that they do occur and that we are not justified in waiting until some systemic involvement has taken place before doing our part. Rosenow's laboratory and clinical findings are borne out constantly in daily practice, and there are but few practicing dentists who could not relate personal experiences that substantiate the theory of focal infection. The Curriculum Survey Committee of the American Association of Dental Schools stated in their exhaustive report in 1935:

> The mouth is obviously the site for the beginning of many infectious processes. Also it is one of the commonly recognized portals for the penetration of bacteria into the body. The etiologic relationship of oral infections to systemic disease is therefore a matter of major importance. Of focal infection, it may be said that it has advanced from the theory stage to that of a widely recognized and generally used principle in the explanation and management of disease.

Yet it is evident that a certain influence has been exerted tending to minimize and even discredit the theory of oral focal infection. This attitude is manifested not only with regard to diseases of the periodontium, but also toward non-vital teeth and apical infections.

I have recently visited some dental educational centers where the treatment and management of periapical infections, of all degrees of involvement, constitute one of the major departments. The attention given to infected supporting tissues as possible foci of systemic infection

may generally be considered negligible. A certain amount of this influence can be traced to a very definite source. It is a well-known fact that in Germany the focal infection theory has never received the indorsement that it acquired elsewhere because their own scientists did not succeed in duplicating Rosenow's experiments and did not confirm his findings. This should explain the skepticism which characterizes the position taken in this country by various dental histopathologists and other scientists who received their training in Germany. These authorities occupy prominent positions in some of our leading dental colleges and their teachings have been in effect detrimental regarding the dangers of oral infections.

It should be remembered that most of these teachers, who are considered authorities in their particular work, are not bacteriologists and have not carried out the experimental work which Rosenow, Haden and others in this country have done and are still doing. Rosenow, as director of the Mayo Foundation for Research, of the University of Minnesota at Rochester, has at his command material from the 80,000 patients who annually pass through the famous clinics. Last February, while visiting the Mayo Clinic, I met Dr. Rosenow, who is still very much interested in the work which has been responsible for his reputation. He told me of a recent case of ulcerative colitis in which the causative factor was two nonvital lower bicuspids with perfect root-canal fillings and no periapical changes. The teeth were extracted under aseptic conditions. A culture was made and the healthy pulp of a dog was inoculated. An ulcerative colitis developed. The patient recovered without further treatment. Cases of focal infection are of common occurrence at the Mayo institute, and the teeth and supporting tissues are given careful consideration in all physical-check-ups.

The experimental study carried on by Paul Boyens and his assistants from this academy, at San Quentin Prison a few years ago, on systemic symptoms arising from periodontal infections added to the existing knowledge on this phase of oral disease.

Clinical observation will reveal that the disorganized soft tissue overlying the crest of impaired alveolar process and adjoining a periodontal lesion is analogous in type and formation with granulation tissue to be found in certain diseased root ends. They are both chronic inflammatory tissue. Clinical observation will also disclose the fact that this tissue in periodontal lesions is more subject to bacterial invasion than apical granuloma owing to its proximity to the flora of the oral cavity; also that it approximates the ideal nidus for bacterial incubation and propagation, the periodontal pocket which contains the necessary elements for that purpose. With a partial or complete stripping of the epithelial lining of the soft tissue component of the pocket, the underlying connective tissue is exposed with its rich vascular and lymph circulation, offering little resistance to invading micro-organisms and their toxins. Their presence has been established in this tissue by many investigators and, accepting this as a fact, it seems but logical that, from this point, a great number of the invading bacteria and their products will be carried away in the circulatory channels and deposited in some distant area of lessened resistance, where they may set up a secondary infection. The ordinary amount of involvement in an apical granuloma is indeed infinitesimal as compared to the total amount of tissue in areas of infection that will be found in a case of periodontoclasia with pockets of only moderate depth. Furthermore, we know that oftentimes root-end infections are walled off by a layer of dense bone laid down for defensive purposes, whereas, in periodontal disturbances, there is no such safeguard.

The past twenty years have not shed a great deal of light on the systemic factors in the etiology of periodontoclasia. We are still very much in the dark when it comes to applying all the data that can be derived from complete physical examinations. It is true that in those cases exhibiting abnormal phosphorus and calcium content in blood serum and those showing extremes in basal metabolism tests, we may feel that the blood chemistry findings and the dysfunctions of the thyroid and parathyroid glands are associated with the symptoms of periodontal unbalance. Yet we have little evidence that any marked improvement of the calcified structure of the periodontium follows treatment of these disorders.

In the field of diet, we find that the lack of certain vitamins will affect the tone and permeability of capillary walls of the gingivae, and that, with proper treatment, this condition can be rectified.

Serious attempts have been made and are still being made in various parts of the world to bring to light all those conditions that are contributing to this most common oral infection. A number of years ago, a grant from the Carnegie Foundation of $80,000 was made to a research group from the Dental College of the University of California to conduct the study of the etiology of periodontal diseases at San Quentin Prison. The results added but little to the scant knowledge that was at hand on the subject.

Further progress will have to be made before all those factors which remain unknown and which undoubtedly have their source in the biologic processes of the body are disclosed. Protein and carbohydrate metabolism are yet to be known and their ultimate knowledge may unfold much that is of importance in our work.

For the results to date of efforts to arrest the destructive and infective processes of periodontoclasia, much credit must go to the practicing dentists for recognizing local etiologic factors and developing technics of treatment. Those trained in the biologic sciences we must continue to encourage by our cooperation and support in the work that they are doing in endeavoring to solve the problem of the underlying causes of the degenerative changes of the periodontal tissues.

SUMMARY

1. Fallacies such as the reattachment theory should be discarded, as they have no place in the pursuit of professional practice. This theory, which has more than any other single fact impeded the development of periodontal therapy, can be considered only as a pure misconception of tissue reaction.

2. In treating periodontal diseases, we should fully realize that we are trying not merely to prolong the life of teeth, but also to remove potential sources of systemic infection. This fact should be stressed more fully so as to make both the profession and the public realize the dangerous consequences of periodontal infections. To disregard or even attempt to minimize the potentialities of oral infection is to discredit dentistry's most valuable contribution to general health. We should always bear in mind that the monumental work accomplished by Hunter, Billings, Rosenow, Haden and Price in scientifically proving the focal infection theory has elevated the plane of dentistry above its purely mechanical phase and definitely placed our profession in the ranks of the healing arts.

1172 Flood Building.

FRACTURE OF THE EDENTULOUS MANDIBLE

By W. I. Jones, D.D.S., F.I.C.A., Columbus, Ohio

THE more any surgical procedure can be simplified, the fewer instruments used and the less the manipulation, the more likely is the operation to succeed.

In confirmation of this statement, illustrations are shown of a method of using a trocar without a cannula for the circumferential wiring of a fractured mandible. Figure 1 shows the jaw before reduction of the fracture. The extreme displacement of the fragments on the right side resulted in great deformity of the face.

Fig. 1.—Amount of displacement, the posterior fragment being pulled outward and upward by the masseter and temporal muscles and the anterior fragment being pulled downward and back by the hyoideus group of muscles.

The patient received a blow from a bare fist on his toothless jaw, resulting in a double fracture of the mandible compounded to the mouth on the right side. There was extreme displacement of the fragments and much deformity owing to the outward and upward pull of the masseter muscle attached to the posterior fragment, and the inward and downward pull of the hyoid group of muscles attached to the anterior portion of the bone.

Barton or other head bandages, and plaster of Paris head caps with molded plaster or metal chin cups are practically useless in such cases, because they do not immobilize the jaw and only serve to increase the deformity if there is any tendency to displacement of the fragments. Likewise, the use of Lane plates or wire passing through the bone in such cases is not satisfactory, for two reasons: (1) they do not immobilize the fragments sufficiently and (2) infection is more liable to occur around them than in circumferential wiring.

This method of circumferential wiring, first advocated by G. V. Black, consists in passing a trocar and cannula through a small incision in the skin at the lower border of the mandible, keeping close to the bone on the lingual side until the mucous membrane is pierced. The trocar is removed and wire passed through

the cannula, and then the cannula is removed, the wire remaining in place on the lingual side of the bone. The same procedure is then carried out, that of passing a straight trocar, cannula and wire through on the labial side of the bone. (My method dispenses with the use of the cannula.)

and the ends are twisted together. The bones stay fixed in position, the wire is well tolerated and the skin and mucous membrane close without suppuration. After the bone is solidly united, a small incision is made in the mucous membrane and the wire is cut and removed by grasping one end of the wire with a

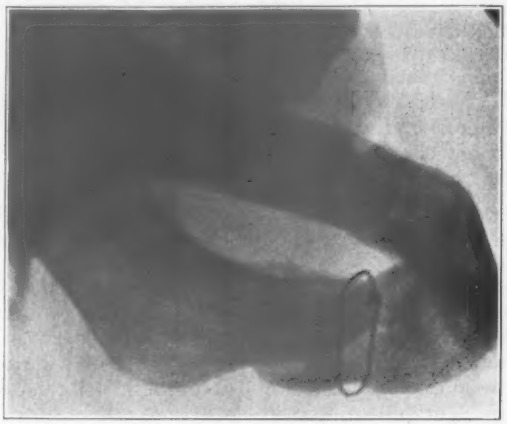

Fig. 2.—Fracture reduced, and steel wire completely surrounding both fragments.

Fig. 3.—Method of employing eyeleted trocar.

It will be seen that the wire completely surrounds the bone, the ends of wire protruding into the mouth. The bone fragments are then manipulated into position, and the wire is pulled tightly pair of pliers. Figure 2 shows the position of fragments after wiring.

Figure 3 illustrates the curved trocar with eyelet threaded with steel wire and the method of passing the wire through the incision in the skin and through the floor of the mouth.

The trocar with eyelet simplifies the operation by obviating the use of a cannula. Its use means one less instrument to handle and consequently one less step in the procedure.

A curved trocar should not be used to pass the wire on the labial or buccal surface of the mandible, but a straight one with an eyelet. Two trocars, a curved and a straight one, are necessary to perform this operation successfully, and the end of the trocar must be kept closely against the bone while passing through the tissues.

327 East State Street.

SYPHILIS AS THE DENTIST SEES IT

By Trim Houston, Corsicana, Texas

IT is indeed most unfortunate that while the dentist often has the best and first chance to observe, in the mouth and on the ordinarily exposed surfaces of the body, the indications of syphilis, both acquired and congenital, he dare not, under any circumstances, let the average patient even guess what he sees. Nor dare he, in many cases, let the patient's physician know what he sees.

In the eyes of the laity, a high percentage of the medical profession, and, still more unfortunately, many members of the dental profession itself, the only portion of the human economy in which the dentist has any right to be concerned is that area bounded by the lips, the fauces, the palate, the tongue and the cheeks on each side; and his only interest in this area arises from a strictly mechanical standpoint.

On any reference to syphilis, in the mind of the laity and of many of the profession, there is an association with the idea not only of sexual intercourse, but also of illicit sexual intercourse, moral depravity and perversion. While it is true that many infections are of this type, some contract the condition legitimately; and there are still others who contract it in all innocence and ignorance, extra-genitally. Whenever and wherever this virus may come in contact with the broken surface of skin or mucous tissue, the original infection takes place, anywhere from the crown of the head to the soles of the feet for the skin surfaces; and on the edge of the eyelids, the tip of the nose and the edges of the lips, also at the urethra, the vagina or the anus, for the mucous surfaces.

Added to this is the fact that while, in one case, the infection is acquired in all ignorance and innocence, in others it is known to be present and no concern is felt for its peril to others. Still others, knowing that they have it, will hide the fact in order to keep from being found out. Because of all the hazards present, there is wonder that any one escapes infection. The fact that this organism does not live long after being removed from its natural surroundings may be the main safeguard against the spread of infection.

The following case histories, from the many cases seen during many years' experience, illustrate the importance of this matter, not only to the dentist, but also to those with whom he comes in contact.

REPORT OF CASES

Case 1.—A married woman, aged 40, childless, was being treated for supposed tuberculosis. Extraction of several teeth had been proposed. The gums were suspicious looking. The husband, first denying vehemently any possibility of syphilitic infection, on being pressed acknowledged that he had been infected when quite young. Heroic antisyphilitic treatment cleared up the supposed tuberculosis. No teeth were lost, and, within six months, the patient was in good health.

Case 2.—A young widow, who complained of rheumatism, presented a condition that seemed to warrant a full-mouth extraction. The condition of the hair, skin, gums and nails all suggested syphilis very strongly.

Intensive antisyphilitic treatment resulted in the saving of all the teeth and in cure of the rheumatism.

Case 3.—A woman, aged 23, had an intractable iritis. Her 19-year-old brother had a hip joint infection. The physician, recalling that twenty years previously the mother had had a suspicious looking oral condition, told the father that the daughter was in danger of losing at least one eye and that the son, in case he recovered, might be a cripple for life. The father thereupon admitted syphilitic infection when he was 18 years of age. His excuse for not volunteering this information was that he, as a leading citizen, did not wish to jeopardize his standing in the community. In a short time, both young people were on the road to recovery, without loss of sight or of limb.

Case 4.—A young man presented a supposed case of incipient tuberculosis. The physician resented and ignored the suggestion that the mouth condition indicated syphilis. Within two years, and again five years later, the wife of the patient bore a stillborn child. The physician then became interested. A Wassermann examination yielded positive findings in both husband and wife.

Case 5.—A woman, aged 35, married and the mother of two boys, was a wreck both physically and mentally. Full-mouth extraction, which was indicated, was carried out at intervals over a period of six months. The gum condition suggested syphilis. The Wassermann reaction proved to be four plus. With treatment, recovery was almost miraculous, from invalid to happy, hardworking housewife. The husband and two boys, aged 8 and 12 years, were apparently normal in every way.

Case 6.—A man, aged 24, who had a necrosed mandible, denied infection, but during his last hours, on appreciating his condition, admitted infection at 16 years, giving a history of a typical case.

Case 7.—A girl, aged 15, the oldest of five children, the others and the mother apparently healthy, grew progressively worse from year to year, from about 6 years of age. Rheumatism, ear trouble and iritis developed. A violent reaction was noted to any mouth irritation. Finally, a Wassermann test gave positive results. The mother, on being so informed, casually asked, "Have you seen any signs in the other children?" On being reproached for not volunteering this information, she said, "It was none of my business to tell. It was your business to find out." The patient, now about 30, is well, teaching school in one of our larger cities and leading a happy, normal life.

Case 8.—A young man, married, with one child aged 1 year, and whose wife had incipient tabes dorsalis, had suspicious looking gums. A Wassermann examination gave a three plus reaction. The patient declared that he did not know how, when or where he contracted the condition. Intensive treatment was given him and his wife and child. His health is now normal. In the wife's case, the tabes is checked; and the daughter, now 16 years old, shows no signs of ever having been infected.

Case 9.—A man, aged 30, married but childless, was treated at intervals for eighteen months for supposed Vincent's infection, by a physician, who resented the suggestion that syphilis might be present. Later, he confessed that when the wife developed a skin lesion, he placed both patients on antisyphilitic treatment, with the result that both are now well.

Here are two cases in which the dentist evidently failed to see what he should have seen.

Case 10.—A baby developed a secondary rash. Both parents were perfectly healthy, but the nursemaid had on her cheek what she called a cancer, which developed a few weeks after a dentist scratched her cheek with an instrument while extracting some teeth. The presence of the supposed cancer led to a Wassermann test, with positive findings. Treatment was given nurse and baby and both recovered. The parents were never infected.

Case 11.—A physician had his teeth extracted by the dentist who shared his office. A syphilitic ulcer developed in the lower molar area in the physician's mouth. The dentist had previously developed a chancre on the left middle finger. Neither ever knew that the other was infected. They are both dead, the physician from an epithelioma developing on the site of the ulcer and the dentist from acute alcoholism.

THE JOURNAL *of the* AMERICAN DENTAL ASSOCIATION

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AUGUST *Editorial Department* 1939

THE MILWAUKEE MEETING

THE City of Milwaukee and the dental profession of Milwaukee and Wisconsin were again the hosts of the American Dental Association, on the occasion of its Eighty-First Annual Session, July 17 to 21, after a lapse of eighteen years.

There was registered an attendance of well over seven thousand and the dentists of Milwaukee very graciously fulfilled every promise made in extending an invitation to the Association to meet again in Milwaukee.

The facilities for the meeting met every demand and the spacious Municipal Auditorium was well adapted to the needs of a large dental meeting.

There were under one roof and being conducted at the same time seven section meetings, the scientific exhibits, moving picture educational demonstrations and the commercial exhibits. An agreeable feature, and one which added much to the comfort and facility of the sessions, was the sound-proof meeting rooms in which the scientific sessions were held.

The subject which received the greatest share of attention was that of the trend toward socialized medical service for the classes of society un-

able to procure adequate or satisfactory service in the present social order. This subject was discussed at the various general sessions by the President, Dr. Ward; Mr. Frank Gannett, Rochester, N. Y.; Dr. Haven Emerson, New York, and Mr. George St. John Perrott, of the United States Public Health Service.

These various speakers presented to the audiences a complete picture of the difficulties and problems involved in an effort to supply adequate health service to the classes which at present are unable to purchase such health service, and discussed some of the methods which have been proposed to meet the health service demands. The subject also received considerable attention in the House of Delegates, which once more reiterated its opposition to health insurance in any form and formulated its objections to the sections of the Wagner Senate Bill providing for health insurance. The House of Delegates, through its National Health Program Committee, also voiced its protest against the formulation of any national dental health program without conference and cooperation with the dental profession.

The National Health Program Committee was made a permanent committee and was charged with the authority and duty of a liaison body for cooperation and conference with the governmental bodies toward developing a national health service. The present administration of the American Dental Association has been much concerned over the developments in the public health service field and the President, Dr. Ward, has done much toward establishing an *entente cordiale* between the governmental health authorities and the dental profession.

Dentistry is at a serious and crucial stage in its development and the future of dentistry will be definitely influenced by the direction in which its educational and public health relations are developed. While nothing definite and final in Congressional action has yet taken place, we are convinced that the professional concern and integrity of the National Health Program Committee will lead to an agreeable solution of this serious problem—one so fraught with potentialities for good or evil to the practice of dentistry.

The continuous and constantly enlarging activities of the Association and the necessity for extending its activities to the cultivation of educational fields which have been more or less untilled led to the proposal for an increase in the dues at the last annual meeting. The response from the membership was not altogether favorable, and, after much deliberation, a motion was made and carried to defer action on this question until next year. Raising the dues or some action that will increase the

funds available will be necessary in the very near future if the American Dental Association is to meet its increasing responsibilities and obligations to the profession. The various educational, executive, public and economic relations of the Association are being gradually extended and we cannot afford to lessen our activities in the face of the present-day trend toward socialized health service.

The auditorium in which the scientific sections were held is indisputably one of the best in which the Association has ever met, providing ample accommodations for attendance, which was quite unusual. We have seldom seen such large, interested and constant attendance at the Scientific Sections, all of which presented programs reflecting the advances of dentistry in all its phases.

One of the attractions of the exhibit section was the display exhibit of the Dental Centenary Celebration which is to take place in Baltimore in March 1940. The foreword for this meeting promises a program that is quite fitting in commemoration and celebration of the historical phases of dentistry.

One feature of all our meetings that probably attracts more acute interest than any other is the general clinics, and this year was no exception. Every phase of dentistry was represented and there were literally hundreds of clinics to demonstrate all of the latest improved procedures in operative, prosthetic, surgical, orthodontic and periodontic phases of practice.

The weather conditions were ideal in contrast to those we have experienced at many of our meetings. Altogether the meeting was so successful and Milwaukee as host made such a favorable impression on the entire attendance that we prophesy that it will not again be eighteen years before another meeting is held in Milwaukee.

The President for the coming year is Dr. Arthur H. Merritt, of New York City, whose administration will be supported by the following newly elected officers and trustees:

President Elect, Dr. Wilfred H. Robinson, Oakland, Calif.; Secretary, Dr. Harry B. Pinney, Chicago; Treasurer, Dr. Roscoe H. Volland, Iowa City; Vice-Presidents, Drs. Frank A. Bull, Milwaukee; B. Lucien Brun, Baltimore, and T. Ford Leggett, Laurel, Miss., and the newly elected Trustees, Drs. H. J. Burkhart, New York; Albert Hallenberg, Fargo, N. D.; Fred J. Wolfe, New Orleans, La., and D. W. McLean, Los Angeles, Calif.

Cleveland, Ohio, was selected as the place of meeting for 1940.

COUNCIL ON DENTAL THERAPEUTICS

NUMIN—NOT ACCEPTABLE FOR A.D.R.

REPORT of the Council on Dental Therapeutics of the American Dental Association, authorized for publication.

UPON receipt of requests for information on Numin, the Council on Dental Therapeutics directed a letter of inquiry to the Numin Company, 29 East Madison St., Chicago, Ill. The firm responded by sending samples of their product, advertising circulars, reprints of articles cited in support of their claims and descriptions of experiments conducted to show the value of Numin in the treatment of dental disease.

For the sake of clarity of presentation, the literature submitted by the Numin Company is given below, either as direct quotation or in the form of a summary of the material presented. In accordance with the notations adopted by the firm, the claims presented and purported evidence for these claims are designated as references.

REFERENCE NO. 1

This consists of a reprint of "The Calcium to Phosphorus Ratio as Related to Mineral Metabolism" by Joseph Z. Schneider, Sc.D. *(Internat. J. Orthodontia,* 16 :277, March 1930.)

This article is a résumé of certain articles on mineral metabolism, especially calcium and phosphorus metabolism as these relate to the teeth. The author expresses the opinion that the significance of vitamin D in calcification of osseous structure has been overemphasized and that the ratio of calcium to phosphorus is of paramount importance. No original data are given.

REFERENCE NO. 2

This consists of an advertising circular which contains, among other things, the following statements:

"NUMIN"—A SPECIFIC MINERAL NUTRIENT TO CORRECT AND TO BALANCE DEFICIENT MINERAL METABOLISM

"NUMIN" is a physiological mineral nutrient, made from specially treated, bovine bone by a reputed bio-chemist, Prof. J. Z. Schneider, of Prague University, Czechoslovakia. It is a *purified bone flour,* not a bone-ash or a calcined product. "NUMIN" has been used in Europe since the World War, as a *specific and an adjunct in the treatment of those diseases and conditions, having a mineral deficiency.* It is known in Europe as JEKOM. Numin is *tasteless and odorless.*

DISEASES AND CONDITIONS IN WHICH "NUMIN" IS EFFECTIVE*

Dental Decay and Rickets
Sinusitis; Hay Fever
Bronchial Asthma
Eczema and Urticaria
Osteomyelitis and Bone Fractures
Necrosis of Bone and Pyorrhea
Arthritis and Tuberculosis
Myocarditis and Hypertension
Osteoporosis and Osteo-chondritis
Prolonged Coagulation of Blood
Before Oral and Nasal Operations
Malposed teeth and jaws
Pregnancy and lactation
Neurasthenia and Chorea Minor
Hyperesthetic Rhinitis
Tetany

*Subsequently to the receipt of this advertising circular, the firm informed the Council that "now, we understand the Council rule, objecting to the names of diseases on the label of the package, for which 'NUMIN' is prescribed; and this latter objection will be removed on the label as soon as possible."

DOSAGE AND ADMINISTRATION OF "NUMIN" PRODUCTS:—

1.—*According to age.* 2.—*Severity of deficiency.* The greater the mineral deficiency in the blood, the more gradually the dose should be increased from week to week. Dose.—"7½ grain" tablets:—4 to 7 daily, *with full glass of water, one hour before meals.*

COMPOSITION: in the dry form, "NUMIN" contains

CaO	28.32%
P_2O_5	26.68%
MgO	0.83%
Bone Protein	18.12%
Bone Fat	6.23%
SiO_2	0.04%
CO_2	2.88%
SO_3	0.01%
CI	0.33%
F	0.08%
CuO and ZnO	0.004%
Fe_2O_3	0.06%
K_2O	0.26%
Na_2O	0.26%

ASSIMILATION AND CHEMICAL COMPATIBILITY:—Absorption of the calcium and phosphorus compounds into the blood, has been shown by blood chemical analysis, to be increased within 2 to 6 weeks, after taking 4 to 9—"7½ grain" tablets, daily. No incompatibility of Numin, is known.

TO ACTIVATE ABSORPTION AND INCREASE RETENTION of the Phosphorus and Calcium salts, the daily use of a natural Vitamin "D" has proven very effective. To be taken with tablets and a glass of water, *one hour before meals.* In *active dental caries,* the addition of Cevitamic Acid (Vitamin "C") tablets is also very effective.

A *minimum daily intake* of *Fats* and *Carbohydrates* should be taken. The average amount of these foods consumed is excessive; they delay absorption of the calcium and phosphorus salts by the formation of insoluble calcium soaps with the fatty acids, and increase fermentation respectively, in the small intestine.

ABSORPTION OF THE LIME CONTENT (CaO) OF NUMIN INTO THE BLOOD

By Prof. *Dr. V. Kucera,* Prague, Czechoslovakia, *March 24, 1929. Confirmed by Dr. J. Z. Schneider, Nov. 23, 1929.*

"In a large series of tests by blood chemistry, undertaken to determine the digestibility of 'NUMIN',—Bone Powder in the stomach and intestine and its resorption in the blood, I herewith declare that after the Numin Powder had been administered for a period of two weeks on the average, the lime content was increased as high as 50%, as compared to the lime content before administration of NUMIN powder. This is evident proof that NUMIN Powder or tablet is an excellent preparation to be used for mineralization and re-mineralization of the patient's blood."

RETAIL SALE PRICES

NUMIN Powder, per box, net weight—
3 ounces $1.45
NUMIN "7½ grain" tablets, per box of 200 .....$1.45
NUMIN "7½ grain" tablets, per box of 125 .....$1.00
NUMIN Chocolate Tablets, 2.5 grams each, per box of 60.....$1.25

REFERENCE NO. 3

This is an advertising circular entitled "Prof. Joseph Schneider's Nutrient for the Betterment of Mineral Metabolism." In this circular, Numin is described as a remedy useful in conditions due to mineral deficiency. It may be used in conjunction with some satisfactory source of vitamin D.

REFERENCE NO. 4

This is a reprint of an article entitled "JEKOM als Erganzung zur Therapie der Knochenkrankheiten" by Prof. MUDr. Stanislav Tobiasek, Vorstand der orthopedischen Klinik, and Ing. Dr. Techn. Josef Schneider. The article contains a chemical description of the product JEKOM (Numin) and a description of experiments conducted on seven human beings and designed to show retention of calcium and phosphorus from ingested Jekom.

REFERENCE NO. 5

This is entitled "Abstract of : 'NUMIN' as Anti-Rachitic Agent, in the

Control of Rickets in Rats, a Feeding Experiment," by Drs. J. Z. Schneider, Tobiasek, K. Willet and O. Felsenfeld.

The data obtained in feeding experiments on forty-seven rats is described. The general conclusion is that Numin can prevent and can cure rickets in the absence of any source of vitamin D. "The rats were removed from the outside, direct and diffused light, and did not receive any source of vitamin 'D' in the diet."

REFERENCE NO. 6

This contains a list of chapter headings of a publication entitled "Calcium and Phosphorus Nutrition, as Related to the Development of the Skeleton and Bone," by Dr. J. Z. Schneider, Charles University, Prague, Czechoslovakia, published in the *Slavic Orthopedic Journal*, March 1929.

REFERENCE NO. 7

This contains a table purporting to show the influence of Numin and vitamin therapy on twelve children as reflected in the analytical data on blood calcium and phosphorus. A portion of the table is herewith reproduced in order to indicate the range of values reported. Apparently, the first values reported are those for calcium and phosphorus levels before treatment.

Name	Age Years	Date	CA Mg.	P Mg.	Product	Vitamin C
H. P.	12	6- 2-37	10.5	2.0	25.0	
Male	4 Mos.	12-24-37	11.5	2.0	—	
		4-18-38	9.9	4.0	39.6	2.5
N. K.	14	10-12-36	10.5	3.6	37.8	
Female		4-26-37	10.6	5.0	—	
		10- 4-37	11.5	5.6	64.4	1.1
D. K.	11	1- 3-35	6.5	3.1	22.1	
Male		3-26-36	12.0	5.1	61.2	
B. G.	12	1-23-35	5.5	2.6	14.3	
Male		8- 7-35	11.6	5.5	—	
		4-28-37	12.5	5.8	72.5	

In a later communication, the firm informed the Council that "the incidence of dental caries as reported occurred in five of the twelve children—about 40 per cent; though in this class of children presenting with malocclusion, their teeth had not been neglected severely." The caries-susceptible individuals were not indicated, nor was the apparent degree of susceptibility specified. The firm further stated to the Council:

It will be noted, *in the first analysis, in the table,* under the heading "Product," the *so-called mineral index of the blood, or the multiplication of the Calcium level by the Phosphorus level,* that in only one child, "J. G." a boy, 14 years, *was the mineral product higher than 40.0 Mgs.* which was 51.0 Mgs. According to H. A. Petersen *(Johns Hopkins Hosp. Bull., 1924) "The union of fractures will not take place, nor will they be healed, when the amount of the product of the Calcium times the Phosphorus level, amounts to less than 38.0 mgs."* This sum or the level of the mineral balance, may be taken to represent the metabolic index of the calcification of the dentine and minimum degree for the ossification of bone in the alveolar process; so necessary for the development of the teeth and jaws accompanying the completion of the 1st. and 2nd. dentitions.

It is very significant therefore, in interpreting the arrested growth of bone in malocclusion of the teeth, that we understand the severity of mineral deficiency present in

each child, before considering orthodontic treatment which if disregarded, may complicate our procedures and results, more than can be estimated.

Reference No. 8

This consists of a "Digest of Biochemical Analysis of Seven Children Between the Age of 7 and 11 years, with Malocclusion."

The serum calcium levels of these children varied from 5 to 10 mg. per hundred cubic centimeters and the phosphorus levels varied from 2.6 to 4 mg. per hundred cubic centimeters. The values for the mineral products (Ca × P) varied from 13 to 28. The above-mentioned figures refer to values obtained before "mineralization and vitamin therapy." After treatment, these values increased enormously, the greatest percentage increase for the mineral product being recorded as 385 per cent, and the smallest increase at the end of the experiments as 125 per cent.

Eight conclusions or observations, based on this experiment, were presented. Observation 8, which is of particular interest in this connection, is herewith quoted verbatim:

> Of the two factors, influencing mineralization, as shown by the Calcium and Phosphorus ratios in children (Not recorded herein) who remained on vitamin therapy without mineralization, and the second factor,—the adequate corrective diet prescribed, it was found, *that the mineral balance of the blood, was not increased by vitamin therapy alone, or by an increased daily intake of milk.* Whereas, the 2nd and even a 3rd biochemical blood analysis showed in patients, *who had a recurrence of dental caries,* and *progress in orthodontic treatment was delayed, it was necessary to remineralize these patients with "NUMIN" Tablets,* to the amount of 45 grains daily (6 tablets, 7½ grains each, 2 tablets, one hour before meals) as a supplement to their regular diet.

It may be surmised from the material presented by the Numin Company that the firm's views may be summarized in substance as follows:

1. Both malocclusion and dental caries are related to or caused by mineral deficiency, specifically by calcium and phosphorus deficiency. This deficiency is expressed by a low value for the product (Ca × P) in the blood serum.
2. This deficiency may be overcome by mineralization with Numin and vitamin therapy and thus dental caries may be arrested and corrective measures against malocclusion be successfully carried out.
3. Numin is much more efficient in "remineralizing" the body than is milk.

A perusal of the literature presented by the firm gives the decided impression that a disproportionate amount of space is devoted to claims and unsubstantiated statements as compared with the factual material placed before the Council. Apparently, the entire body of claims of clinical effectiveness in treatment of caries and malocclusion is based upon the findings on only nineteen patients. It is not clear how many of these patients had active caries or which patients had active caries. In one "reference," the Council was informed that more than 40 per cent of a group of twelve patients had caries. In another "reference," the firm categorically stated that milk and vitamin therapy is inefficient for "remineralization." The statement was not substantiated by evidence of any kind. The claim that the product (Ca × P) is a fundamental factor in caries and malocclusion is interesting, but the firm presented no data to substantiate the claim. So far as the Council is aware, there are no conclusive scientific data to warrant this assumption. It is true that dietary deficiency may be one of the factors in malocclusion. Apparently, the Numin Company has elected, however, to disregard all other factors.

That Numin is preferable to milk and other foods containing calcium and/or

phosphorus in supplying these elements for human needs is open to serious doubt. There is no evidence of its superiority over tricalcium phosphate or dicalcium phosphate. Indeed, if the product has the properties claimed for it, it should consist mainly of some form of tricalcium phosphate and accordingly its behavior in the body as far as solubility and absorption are concerned should be similar to that of pure dicalcium phosphate and tricalcium phosphate.

Sherman, Rose and Rose *(J. Biol. Chem.*, 44:21, October 1920) state: "If every child got a quart of milk and every adult a pint daily with a reasonably good selection of food for the rest of the diet, all the calcium and phosphorus requirements of normal nutrition would be met."

ing evidence is not available that the addition of calcium compounds to a diet not deficient in calcium (and phosphorus) will retard, prevent or arrest caries or diseases of the gums supposedly associated with a lack of calcium."

Karshan ("Dental Science and Dental Art," S. M. Gordon, editor, Philadelphia: Lea & Febiger, 1938, pp. 339-340) has summarized the findings on blood serum calcium and blood serum phosphorus in relation to the incidence of dental caries. The available data are presented herewith:

Apparently, there is no definite relationship between the levels of calcium and phosphate in the blood serum and immunity or susceptibility to dental caries. It may be observed, moreover, that the Numin Company has reported cal-

Investigators	Caries Free Calcium Mg./100 Cc.	Phosphate as P	Active Caries Calcium Mg./100 Cc.	Phosphate as P
Karshan, Krasnow & Krejci	10.6	4.1	10.8	3.7
Jundell & Magnuson	10.55	5.01	9.92	4.71
Hubbell	10.3	4.9	10.1	5.0
Boyd, Drain, Stearns	10.4	4.2	10.6	4.4

The Council on Pharmacy and Chemistry of the American Medical Association (N.N.R. 1938, p. 157) states:

> The average normal diet usually contains just about enough calcium for the needs of the body, but when unusual diets are taken there may be a calcium deficiency. This may be remedied by the administration of natural foods having a high calcium content, such as milk, green vegetables and egg yolk. The administration of special preparations of calcium salts is indicated only in special pathologic conditions, especially tetany. The administration of calcium salts in the treatment of rickets or other diseases associated with deficient calcification is in itself inefficient, but may be used as an adjunct in the treatment when vitamin D is also administered.

The Council on Dental Therapeutics states (A.D.R. 1938, page 89): "Convincium values as low as 5 mg./100 cc. for blood serum. The fact that a value of 7 mg./100 cc. has been accepted as the level at which or below which tetany develops apparently has escaped the firm's attention. This information may be found in elementary textbooks on biochemistry (e.g., Bodansky's "Introduction to Physiological Chemistry," Ed. 3, New York: John Wiley and Sons, Inc., 1934). Bodansky also points out (p. 271):

> The constancy of serum calcium is very striking. Even though considerable amounts of calcium (and phosphorus) are lost from the body as a result of undernutrition or starvation, the content in the blood remains unchanged.

In the light of the foregoing, the Council finds itself unable to accept Numin (A Mineral Nutrient) on the basis

of the claims made or on any basis of evidence thus far presented.

The Council does not doubt that Numin, when taken according to directions on the package, may increase the calcium or phosphorus content of the blood temporarily in some cases. There is, however, no evidence which would warrant the routine use of this product in the treatment of dental disorders. In any event, the use of Numin or any other mineral product for the purpose of increasing serum calcium or phosphorus should be secondary to procedures instituted to determine the cause for such deficiency. It must be remembered that milk and other natural foods are excellent sources of calcium and phosphorus. No acceptable evidence has been presented that Numin is superior to milk or even equal to it.

Before final consideration of Numin as a food for well-defined deficiency diseases may be undertaken, it should be recalled that the data supplied by the firm assigns to Numin a fluorine content of 0.08 per cent. On this basis, and bearing in mind the dosages recommended by the firm, it may be calculated that an individual who consumed the maximum amount of Numin recommended on the package labels would ingest 2.3 mg. of fluorine daily. The daily ingestion of about one quart of water containing fluorine in a concentration of 2 parts per million represents a consumption of 2 mg. of fluorine. It is well known that the consumption of water containing this concentration of fluorine can produce mottled enamel in the permanent teeth of a large percentage of children. (Report of the Council, J.A.D.A., 19:861, May 1932.) That the Food and Drug Administration of the Department of Agriculture has recognized the toxic potentialities of fluorides is shown by a recent memorandum in which the tolerance for fluorine in certain types of foods is set. The tolerance for fluorine in apples and pears is set at 0.02 grain per pound. It is evident that in any complete consideration of products promoted to the profession or the public, and especially those advocated for use in children, all possible harmful effects as well as possible beneficial effects accruing from the use of such materials should be critically examined. Such examination must of necessity take into account not only directly harmful or beneficial effects, but also those properties which may contribute to such effects.

Numin, which is essentially a powdered beef bone, is a product marketed by the Numin Company, Chicago, with a noninformative name and with misleading and greatly exaggerated therapeutic claims. The firm recommends administration of this powdered bone to supplement the diet of young children without taking into consideration its relatively high content of fluorine, a toxic element which is responsible for the condition of mottled enamel. For these reasons, the Council declares this product not acceptable for Accepted Dental Remedies.

A copy of the rules that govern the Council in the consideration of articles will be sent on request.

HAROLD L. HANSEN, *Secretary.*

PROCAINE SOLUTION 2% WITH EPINEPHRINE 1:50,000—ECONOMY CHEMICAL COMPANY BRAND AND PROCAINE SOLUTION 2% WITH EPINEPHRINE 1:25,000—ECONOMY CHEMICAL COMPANY BRAND DELETED FROM THE LIST OF ACCEPTED DENTAL REMEDIES

After a thorough and painstaking investigation, during the course of which the Economy Chemical Company was given adequate opportunity to present the required evidence, the Council has been compelled to apply Rule 5 to the products of this firm. In accordance with Rule 5, no article will be accepted or retained concerning which the manufacturer or his agent makes false or misleading statements as to source, raw material from which made or method of preparation.

Since the information supplied by the Economy Chemical Company is subject to the regulations contained in Rule 5, the Council has voted to delete the products of this firm from the list of Accepted Dental Remedies.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Local Anesthetics*

Procaine Hydrochloride-Neo-Quest Brand: A brand of procaine hydrochloride, U.S.P.
Manufactured by Neo-Quest Chemical Company, Inc., Long Island City, N. Y. No U. S. patent or trademark.

The Acridine Dyes†

Acriflavine-Abbott: A brand of acriflavine base, U.S.P. (A.D.R. 1938, p. 124).
Acriflavine Tablets, 1½ grains (0.1 gm.)
Manufactured by Abbott Laboratories, North Chicago, Ill. No. U. S. patent or trademark.

Calcium Compounds‡

Calcium Gluconate-Abbott: A brand of calcium gluconate, U.S.P.
Tablets Calcium Gluconate-Abbott (Flavored) 1 Gm. (15½ grains).
Manufactured by Abbott Laboratories, North Chicago, Ill. No. U. S. patent or trademark.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

Harold L. Hansen, *Secretary.*

*A.D.R. 1938, page 36.
†A.D.R. 1938, page 122.
‡A.D.R. 1938, page 89.

ASSOCIATION ACTIVITIES

COMMITTEE OF THE AMERICAN HOSPITAL ASSOCIATION ON DENTAL CARE AND INTERNSHIPS IN HOSPITALS

RECOGNIZING the need for an extension of and for uniformity in the dental services in hospitals in America, and the desirability of better facilities for dental internships, the Council on Professional Practice of the American Hospital Association has appointed a committee for the purpose of studying this relationship and compiling a manual on dental services in hospitals. As the president of the American Hospital Association is resident in Toronto, Canada, and is deeply interested in clinical services and internships in general, the Council on Professional Practice agreed that the nucleus of the committee might readily be zoned in the Toronto, Canada area, with corresponding members located elsewhere on the continent, and that the American and Canadian dental associations be asked to participate in this study. It is then proposed to submit the draft to leading educators and directors of hospital dental services for their criticisms and suggestions.

This is an excellent opportunity for the dental profession to outline the ideal hospital dental service, to suggest the relationship of the dental to other clinical services and to set forth the educational possibilities of the hospital in the training of the dental surgeon. When accepted for publication, this manual will become one of the official bulletins of the American Hospital Association.

The Committee on Dental Services in Hospitals is an organizing, coordinating and editing body, formed at the request of the Council on Professional Practice, acting under the authority of the American Hospital Association and entrusted with the task of directing the preparation of a manual on dental care and internships in hospitals.

The manual, after approval by the Council on Professional Practice, will be adopted by the American Hospital Association as the official outline of standards for the formation, equipping, administration and direction of dental services in the member hospitals of the association in the United States and Canada. The committee is composed of a general chairman, appointed by the Council on Professional Practice of the American Hospital Association, a general secretary and two assisting local members, one of whom is an oral surgeon with hospital training and one a general practitioner with wide experience in public dental health. These men together with a local medical representative of the Council on Professional Practice (the present president of the American Hospital Association) constitute the nucleus committee.

In addition, there are two representatives of the American Dental Association, appointed by the Association, and two representatives of the Canadian Dental Association appointed by that organization.

At the discretion of the nucleus committee and with the approval of the

Council on Professional Practice, additional representatives of the interested bodies may be appointed to the committee, if such appointments appear advisable to facilitate the completion of the study.

The American Hospital Association desires to afford every opportunity to the dental profession to participate and cooperate in formulating the standards which will determine the future status of the dental service and its personnel in the member hospitals in Canada and the United States. The committee will be appreciative of any suggestions or assistance which can be obtained from other organizations or committees, and will be happy to give due credit to work already done by other bodies.

The committee at present is composed of:

1. A nucleus committee located in Toronto, Canada, consisting of:

Chairman: T. L. Marsh, 2 College St.

Secretary: Ralph G. Harris, 2 College St.

Oral surgeon: George S. Morgan, 2 Bloor St., East.

General practitioner: A. E. Higgins, 86 Bloor St., West.

President of the American Hospital Association: Harvey Agnew, 184 College St.

2. Two representatives of the Canadian Dental Association:

G. Vernon Fisk, 170 St. George St.

Harvey W. Reid, 190 Yonge St.

3. Two representatives of the American Dental Association:

Chairman: William H. G. Logan, 55 E. Washington St., Chicago, Ill.

Secretary: Lon W. Morrey, 212 East Superior St., Chicago Ill.

THOMAS L. MARSH, D.D.S., *Chairman,*
COMMITTEE ON DENTAL
SERVICES IN HOSPITALS,
18 E. Division St.,
Chicago, Ill.

COMMITTEE ON LEGISLATION

COURT UPHOLDS DENTISTS' AD BAN

KENTUCKY's new law forbidding dentists to advertise that they extend credit has been upheld by the Court of Appeals.

The whole court sitting upheld Special Judge Richard Priest Dietzman's denial in Jefferson Circuit Court of an injunction to F. F. Reynolds, a Louisville dentist, against the state board of dental examiners.

Reynolds stated that the board threatened June 11 to cancel his license and that of any other dentist who advertised "credit or terms of credit"; that he had built up a "substantial business" upon credit, and that such action violated his constitutional rights.

A 1938 amendment to the state dental law authorized the board to revoke, suspend or refuse to renew licenses of dentists who advertised credit.

Judge Gus Thomas, writing the Appellate Court opinion, said that it was agreed in the arguments that the dental profession was subject to the state police power and also that "the legislature must act reasonably and its regulations must have some reference to the public health, morals, safety or general welfare."

Judge Thomas held that in prescribing "regulations for a profession, different considerations apply from those where a purely commercial enterprise is involved."

"All dentists, as well as surgeons and members of other professions, are not of equal capacity," he continued, and he

declared that it was "within the province of the legislature to forbid the attempt to influence the public generally in selection of a dentist through the media of advertisements of credit or credit terms." —*Louisville Courier-Journal.*

NEWS ITEMS

Training of Dental Interns in Army Hospitals

The U. S. Army is for the first time undertaking to train dental interns in its hospitals. Announcement of this new departure, seen as a development that will make the Army dental service more effective as a health service, was made by Brig. Gen. Leigh C. Fairbank, chief of the Dental Staff, U. S. Army, at the meeting of the New York Second District Dental Society. Outstanding graduates of dental schools this year will be chosen for the new Army hospital internships.—*Science News Letter,* April 1, 1939.

The Control of Cancer

April has been designated as Cancer Control Month by a special act of Congress. The Women's Field Army, which was organized in 1936 by the American Society for the Control of Cancer to disseminate sound, conservative information on cancer control, has been definitely responsible for quickening of interest in all aspects of the cancer problem. It is the liaison between the individual and the medical profession.

In its program of lay education, the Women's Field Army attacks cancer along the following five avenues:

1. To teach every man, woman and child in the country that early cancer is curable and that general mortality figures can be lowered only by courageous alertness and prompt action by the individual.

2. To distribute widely literature describing the early signs and symptoms that might mean cancer.

3. To emphasize the importance of a complete annual physical examination by a competent physician.

4. To interest men and women in all aspects of cancer, diagnosis and treatment, research and related problems.

5. To enlist during April as many men and women as possible in the Women's Field Army of the American Society for the Control of Cancer at a fee of $1.00. The money is necessary for educational work.

Of particular interest to the dentist is the third of the five "danger signals," or symptoms that may mean cancer. It is he who is frequently the first to be consulted about the "sore that does not heal, particularly about the tongue, mouth or lips."

The danger signals that may mean cancer and should always mean a visit to a physician are:

1. Any persistent lump or thickening, especially of the breast.

2. Any irregular bleeding or discharge from any of the body openings.

3. *Any sore that does not heal, particularly about the tongue, mouth or lips.*

4. Persistent indigestion, often accompanied by loss of weight.

5. Sudden changes in the form or rate of growth of a mole or wart.—Louis H. Jorstad, M.D., of the Executive Committee, American Society for the Control of Cancer, in *J. Missouri D. A.,* April 1939.

BUREAU OF PUBLIC RELATIONS

FEAR CONTROL IN CHILDREN'S DENTISTRY

By W. J. Pelton,* D.D.S., Washington, D. C.

FEAR is the most common emotion that man experiences. Dental caries is the most nearly universal chronic disease in modern civilization. Since there is but one other condition that interferes more with the progress of the dental profession in its service to children than fear stimuli, our interest in learning how to overcome apprehension or allay terror should be profound. Aside from the inability of their parents to pay for service, dread of pain keeps more young patients away from a dentist's office than any other condition. How to promote a better relationship with our young patients in the hope of making dental work both easier and more lucrative is our concern in this discussion.

Without a reasonable amount of fear, man could not remain alive. It is, moreover, a driving and a retarding force, impelling toward signal achievement in some instances, restraining from disaster in others. In child training, every effort should be made to use fear as a spur or a protection, not to let it be a curse. The instinct of fear, being a natural impulse toward self-preservation, is wholesome in growing children if properly controlled. Since fear has to do with escape from danger and pain, it is harmful only when misplaced and out of control. Psychologists doubt that a child has any inherent fears at birth. Instead, they believe fears are generated by experiences the individual passes through in early life. An abnormal fear of physical pain has been produced by the reiteration that a thing forbidden will be painful. Children are quick to infer, therefore, that avoidance of pain is an all-important thing in life. Fortitude, or the ability to cope with and endure pain, can be built up in even an infant. Though the dentist should not feel too much concerned about frightening little children, it is his duty to be gentle and helpful in training the child in fortitude.

If we are to control fear, we must realize that imitation plays a very important part in the fears of childhood. Children copy not only the speech, manners and general conduct of their parents, but also the mental attitude. The attitude which a child adopts toward any situation is very likely to be one that he has seen displayed by his parents. The mother who is obviously terrified by objects and events passes the tendency to the child, not as an inheritance, but as a conduct pattern which the child instinctively follows. The dislike of adults for dental treatment is reflected many times in the attitude of their children who have overheard detailed and gruesome descriptions of a dental appointment, including such expressions of aversion as "I hate dentists!" or "I hate the drilling!"

Another source of fear lurks in the dental office environment. In all types of practice, fear stimuli that operate

*Passed Assistant Dental Surgeon, United States Public Health Service.

through the special senses should be removed, or at least reduced. The pedodontist is the one practitioner who seems aware of the possibilities of minimizing the fear stimuli in his office environment and who is cognizant of the value of the psychologic approach to the fear problem in patients.

In a survey of 400 children,[1] it was demonstrated, moreover, that economic status and culture influence children's fears. Children of cultured parents fear the possibilities of accidents or actual dangers such as poor health, failure to achieve and economic insecurity. Children of uncultured parents fear characters from fairy stories and gruesome creatures or persons of authority who have figured frequently in dire threats made in attempts to discipline.

A child may overcome fear in two ways: simply by growing up or by disciplining himself. General experience teaches the child to cope with events that once found him without an adequate response. For instance, if a child who fears a vacuum sweeper has repeated contacts with it, he loses his fear. Let him meet other harmless but strange objects with the same result, and soon he will grow accustomed to a large range of objects. Eventually, his environment will offer fewer and fewer elements of strangeness. Goodenough[2] points out that in preventing fearfulness and helping a child to maintain self-confidence, his parents should see that his natural exploratory tendencies meet with pleasantness and success whenever possible. This, then, is the reason for taking an uninitiated child on a short introductory tour through the strange environment of a dental office. To further support such practice, Rosenau[3] states that, from birth until death, the individual explores his environment constantly by sight before he moves into it.

Data about self-discipline elicited from adults by surveys[1] indicated that, in childhood, they made deliberate attempts to overcome fear of the dark by entering dark places. With this in mind, by resorting to praise, the dentist can aid a child to discipline himself, for a child will try to live up to a statement about his fortitude. More will be said about this practice later.

By promoting normal development, giving advance instruction and avoiding threats, others can aid children in fear prevention.

Although it is the parents' job to discipline, they should allow a child to develop normally by competing with others of his age in play. If a child cannot climb, throw or tumble, he cannot keep pace with his playmates, and hence he feels insecure in his social relationships. A child with little motor skill and an unusual social approach is shy and apprehensive of ridicule. Those who shield a child from physical emulation contribute to the dwarfing of his personality. Such a child is easily recognized by a dentist.

As for advance instruction, it allows for mental preparation and eliminates the shocking form of surprise. If the parent or dentist who forewarns shows undue concern, however, the effect is lost, and the warning may be even a detriment because it suggests danger where there is none.

The most important factor in fear prevention is the avoidance of threats. It is a weak parent who resorts to threats of action by the policeman, "bogey man" or doctor in an attempt to discipline or subdue a child. Such threats may produce one of two attitudes in the child: he may become timid and fear-hampered, or he may realize early that the threats are idle and meaningless, and then play up his fear of the doctor in an effort to escape having his teeth treated.[4] It is evident that the doctor, on whom the child and parent are so frequently dependent in times of emergency, when portrayed to the child ominously assumes a task unnecessarily difficult

when he actually is called upon to render treatment.

In dealing with methods to help the child overcome fear, we must consider first whether to allow him to escape the situation by removing the concrete occasion for fear. For example, if the handpiece is the fear-provoking agent, we can allow the child to escape it by substituting hand cutting instruments. To allow him to escape the dentist, however, is not possible if his health needs are considered.

The second consideration, verbal explanation and reassurance, may be effective when the frightening agent (the strange doctor) has been successfully identified with some one the child does not fear. Often, the reassurance is accomplished in practice when the dentist converses amicably with the youngster's parent after first speaking to the child by name. The personality of the operator is opened to the child for inspection and opinion without the child's feeling that he is on the defensive. The friendly conversation between the parent and the stranger shows the child that his mother has no fear, and hence he can dismiss his distrust. When a child has learned distorted facts from playmates, premeditated discussions between adults within earshot of the child often dispel his fears.

A most effective adjunct to verbal explanation is a practical demonstration as a means of reassurance. If the handpiece is feared, the operator can verify its harmlessness by carving the child's initial on his finger nail. These tactics enable him to introduce the bur into the child's mouth without causing excitement. As the operation becomes painful or obnoxious, another technic can be introduced to promote fortitude.[5]

In attempting to induce children to submit to treatment, those in authority should appeal to their power of reasoning. In a survey, when 400 children[1] were asked what would be the worst thing that might happen to them, 72 per cent replied, "To be sick or have an accident." To the pedodontist, the inference is helpful. Being capable of understanding sequence, children will be impressed when it is pointed out that a little discomfort in a dental chair will limit the possibility of ill health later.

Analyzing the cause of the fear is the third consideration. It goes hand in hand with verbal explanation. Not all fears can be banished by analysis, since a child may not recall all the factors in his fears. In reference to a practical solution of an actual problem in the dental office, Easlick[5] cites an instance in which the removal of the white operating coat calmed a child patient who had been trembling, crying and showing extreme fear. The cause of fear had not been the dentist himself, but an association of the white coat with a former unpleasant experience in a hospital or barber shop.

Adults are prone to give a child's fears little attention. The youngster's fears are foolish to adults because of their inability to understand how certain experiences can leave upon the mind of the child impressions which govern his conduct for a long time. They do not make inquiry into their cause nor try to eradicate them by careful explanation.

The fourth means of aiding a child is to show him specific methods of coping with fear. In a dental office, for example, he can be instructed to stop the operation of the handpiece or bur by raising a finger—a prearranged signal which the dentist is honor-bound to respect and the child honor-bound to give only for due cause.

The fifth method is to provide opportunities for gradual habituation. We may accomplish this by using the first appointment for taking x-ray films, giving a prophylaxis, giving toothbrushing instructions and performing non-painful operations first. When large cavities must be prepared, good practice demands that

the painful areas be not approached until habituation and fortitude have been promoted.

Sixth, offsetting experience with a feared event through the use of counterstimuli is the best expedient the dental profession can employ. A pedodontist who adopts a friendly manner and who has established an interesting office environment can attract a child patient to his office by providing such counterstimuli as toys. Fear is often outweighed by curiosity, and repeated contacts ending in a pleasant surprise in the form of a souvenir will do much to cause the fears to wane.

Fears are easily conditioned in young children during the labile period in which organization of mental processes is actively taking place, through exposure to situations beyond their developmental maturity. Young children have been conditioned to fear rabbits by the alarming clang of a loud bell occurring simultaneously with the appearance of a rabbit. The same children were reconditioned when the rabbit was gradually and quietly introduced at meal time, since it was brought into a pleasant rather than unpleasant configuration. The association of the feared object with a desired object eliminated the child's fear by direct conditioning. If a child who fears the dentist is given a toy or souvenir at each appointment, he soon learns that the dentist is not a person to be feared, and the unpleasant aspects of the appointment are forgotten.

In Jersild's experiments,[1] when the children were asked what they would like if they could have a wish come true, almost two-thirds specified toys, a knife that works, toy soldiers, etc. When asked what was the best thing that had ever happened to them, the larger percentage named a diversion or activity, but the rest mentioned the receipt of a specific object. Furthermore, in answer to what they liked best, the larger percentage liked, after mothers, fathers or other relatives, specific objects, such as toys, clothes and pets. Obviously, the dentist who gives a child a souvenir at each appointment fulfils a subconscious wish, duplicates a best happening and presents a coveted piece of property. Experiments support the practice of giving children presents at the end of dental appointments, since it is a utilitarian approach to direct conditioning.

The seventh consideration, indirect therapy, such as bolstering the child's confidence in himself, is of great value. In this respect, praise of his teeth, dress, fortitude or habits helps him to overcome self-censorship and disparagement. Since older children are prone to picture themselves as playing a heroic or superior rôle, a child may be induced to undergo an ordeal as a proof of courage. Examples of a fearless playmate's conduct in a dental chair may be strong enough to urge a duplication of such fearlessness. Conversely, an uninitiated youngster should not witness an exhibition of fear and pain by another child in the dental chair. The dentist who assures his patient that he is a better patient than the average child elevates the child's ego and satisfies his desire to be superior. The opportunity to achieve success and become the dentist's best patient will color his behavior. Experimentally,[6] it has been found that praise added to a successful performance improved subsequent performances and that a reward improved the performance still further.

Though the language should, of course, be simple, conversation with a child should be on an adult plane. The dentist at the dental chair, moreover, should be on the same eye-level as the child. When the operator sits on a stool, the child does not feel subdued or overpowered. These counterstimuli are not a salve to the vanity so much as an avenue that will allow the child to tackle his fears through a side door.

Since the special senses play a rôle in eliciting fear from one's environment, it

is important that the dental office be light and cheerful. The fact that color preference changes with age, sex, conditions and materials[6] should be kept in mind and the decorations should appeal to both boys and girls. Color combinations such as light blue and yellow are significant adjuncts in creating an attractive atmosphere.

Specially decorated playrooms for the young person may have some value in that story book and nursery rhyme characters lend a familiar touch to render new surroundings less strange. Obviously, a picture of "Custer's Last Stand" would not be considered suitable as a wall decoration.

Though the desirability of certain accessories, such as sand piles, in a playroom may rightly be questioned, the sight of chairs and tables of child size is distinctly an advantage because it shows the child that he is not entirely in a grown-up world.

People have always believed and naturally cling to the notion that anything that has a bad odor must be detrimental to health. The odors of medicaments permeating hospitals and doctors' offices excite an uneasy and apprehensive attitude through association with the horror of the place, real or imagined. While these disagreeable odors are not harmful, they should be eliminated from the dental office for esthetic and psychologic reasons.

Odors can be rendered inoffensive by a stronger smell. Formaldehyde, because of its strong medicinal odor, is not recommended. Obnoxious scents may be neutralized with ozone or air. Opening windows to ventilate the office from time to time is good practice, and a jet of air frequently played against clothing will remove the source of certain odors. It is unnecessary, of course, to discuss personal odors, yet children may not tolerate them.

Unpleasant tastes, too, must be guarded against. The sensations of taste are closely associated with those of smell. The linings of the nose and mouth fuse the taste and odor to make a total experience which we mistake for mere taste. The feel of a substance in the mouth also influences taste perception. Cleansing paste and pumice have no significance as to texture, but their odor is important. Pumice, being a gritty substance, is similar to sugar if sweetened. Strong tasting and undesirable medicaments can be eliminated profitably from children's dentistry.

Physicians and dentists, constituting objective fears that can be seen or heard, are comparatively easy to attack, for efforts can be directed through education and training. Maturation and development are Nature's aid to the cause.

It is evident, therefore, that if we are to control child fears, we must recognize that they arise chiefly in the home. A child reflects his home life and training when he comes under the care of the dentist. If the child has been threatened at home with "the doctor pulls the teeth of little boys who are bad," then one can hardly expect him to be a good patient. Even if fear is the basis for all punishment and plays a rôle in controlling conduct, it certainly has no place in children's dentistry as a means of controlling patients.

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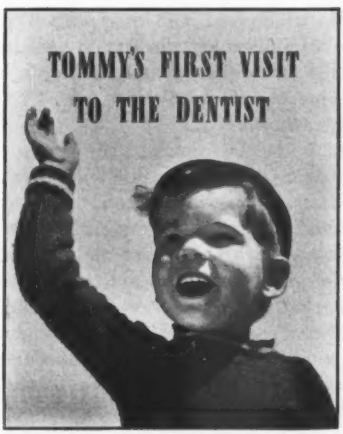
DENTAL EDUCATION IN SOUTHERN CALIFORNIA

In order to increase the interest in children's dentistry, the Dental Health Education Committee of the Southern California State Dental Association, June 1, mailed a copy of "Tommy's First Visit to the Dentist" to every practicing dentist within their territory. Accompanying the booklet was a 275 word letter stressing prevention:



"The Child Patient of Today Is the *Adult* Patient of Tomorrow." Prevention, being the watchword of the dental profession, challenges every practicing dentist to assume the responsibility of rendering the best dental service possible for the young patient. . . . To avoid a continuation of the present deplorable dental condition among children and to promote mouth health of the future childhood population, it behooves the dental profession to start now and give regular dental supervision and prophylaxis and to correct dental defects while they are small, and

before they produce permanent disability and possible disfigurement.

Simultaneously, the Southern California Dental Association gave a copy of "Tommy" and a 250 word letter to 2,000 officers and delegates at the California Parent and Teachers Association Convention:

"The Health of the Child Is the Power of the Nation." The aims and achievements of mouth health education are great and surprisingly far flung. The teeth are naturally the first to benefit, but physical and mental health are strongly influenced by mouth health. A program of prevention is the keynote of a desired result . . . preventive dentistry must be applied from the beginning of conception throughout life . . . beginning at 2 or 3 years, children's teeth should be examined every four months. . . . The teeth should be cleaned regularly by a dentist and small defects corrected before they produce permanent disability. . . . Children should learn how to properly brush their teeth at an early age and should have the protective foods.

The Southern California State Dental Association is doing a fine piece of educational work that other societies might well emulate.

THE NEW JERSEY PLAN FOR CONVENTIONS

By L. J. Fitzsimmons, D.D.S., Newark, N. J.

At the annual meeting of the New Jersey State Dental Society held in Atlantic City, April 19-21, a committee on dental science and literature presented advancements and refinements in three branches of the profession. The phrase "What's new in instruments?" (materials, apparatus or literature pertinent to preventive dentistry, periodontia, surgical dentistry and restorative dentistry) was adopted as the slogan of the group and all posters on display carried it.

Prior to this year, dentists visiting the meeting were usually busy attending the lectures on procedures commonly followed by the private practitioner, allowing new processes, instruments, apparatus, materials and books to be presented to the profession by representatives of the manufacturers having exhibits at the convention. This year, the dental society took over the task of presenting advancements and refinements in matters of interest to dentistry.

The manufacturers gladly cooperated with the local committee, stating that they believed the society's plan would help both dentist and exhibitor. The timidity which attends a visitor's pause at the exhibitor's booth has done much to prevent the new product from being properly placed before the profession. The thought that time was being wasted by the exhibitor because no sale was in prospect has prompted many a dentist to leave the display before he has become acquainted with the merits of a new material, instrument, apparatus or book.

As many manufacturers as possible were contacted by the committee and asked to place their latest products in the new section. It was explained that this entire section was to be manned by members of the New Jersey State Dental Society. The usual display of the manufacturers was held in another part of the convention hall. The fact that the men behind the tables were fellow members of their own society prompted visiting dentists to keener questioning regarding the merits of the new material, and incidentally this important fact was recog-

nized by the manufacturers when they whole-heartedly consented to help the society.

The Medical Society of the State of New Jersey materially aided in the work by sending clinicians each day to serve in an open forum on "What's New in the Correlation of Medical and Dental Service?"

The New Jersey State Dental Assistants Association also reserved space in the section for a display on "What's New in Dental Assisting?"

A survey of the committee's work showed that much of what was displayed had not yet been advertised in the commercial journals. There was much on display from manufacturers who had not taken space in the regular commercial exhibit. The same was true of new books. Most publishing houses had taken space, but a few were still missing. Regardless of this fact, the committee impressed the board of trustees of the state

Exhibit at convention of New Jersey State Dental Society. Slogan: "What's New in Dentistry?"

In order that eastern universities might project themselves into the picture of the committee's work, three deans were asked to hold an open forum daily on "What's New in School?" Maryland, Pennsylvania and Columbia were represented by J. Ben Robinson, Charles R. Turner and Houghton Holliday. New York University College of Dentistry sent Tilton M. Barron, A.B., assistant librarian, to supervise "What's New in Literature?"

society with the fact that this work, to be complete, must present the latest advancements and refinements, regardless of the fact that space had not been taken by some of our contributors. The judicial body saw eye to eye with the committee and, too, looked into the future, realizing that, in coming years, many manufacturers would hasten to have the committee display their new wares and would

take space also, in order to meet the demand that would be created by the dental profession privately evaluating a new product.

The committee did not feature any single product of manufacturer or publisher. The theory of a subject was presented, showing the use of the new product and explaining an operation with new instruments taking their places in the armamentarium, and then referring to the published writings on the subject, which were on display.

Leaving the display, the men then visited the commercial exhibit or clinic with well based ideas on materials, instruments, processes and books, strengthened to resist any undue pressure from an overzealous exhibitor.

A résumé of the results of this venture showed that there was a freer expression of opinion than had heretofore been evident. Questions were asked which would not have been ventured had the manufacturer's representatives been addressed. Good and bad points of an item were freely discussed. A type of questioning was followed that is foreign to a large or table clinic. The men, sensing that their fellow members behind the tables were simply introducing the new product, asked more questions concerning possible failures. This type of query is usually softened a little when it is broached in open clinic or addressed to an exhibitor.

When surrounded by his fellow practitioners, the visitor to the section examined a product with greater thoroughness. A dental depot manager offered a reason for this. He said, "Certain men put up a defense against salesmen. When the question 'Doctor, would you like to know more about that new instrument?' is asked, that defense comes to the fore. With a knowing smile, they decine and pass on. The fact that there was not a salesman within a mile of your section resulted in a much greater show of interest and more careful inspection."

The opinion of the university librarian effected many book sales. One of the publishers who had a booth in the commercial exhibit declared that more books had been sold at this meeting than any other one of its size along the Eastern seaboard.

A new forceps which had not as yet been pushed by the manufacturer made such an impression that it was necessary to send to a nearby city for an extra quantity to place on sale and for exhibit at the booth.

The camaraderie of physicians and dentists during the open forum on the correlation of medical and dental service was gratifying. One physician was heard to remark, "I learned more about dentistry this morning than I ever knew before!"

One of the universities, through its dean, extended an invitation to a section of the committee showing advances in restorative dentistry to participate in a program of research just starting at his institution.

Another university through its dean promised the literature section a historical display tracing the growth of dental literature from the time the profession became a separate branch of the healing art.

The fact that the deans were present made the section a general alumni reunion spot for the entire convention.

The final and crowning point of the work, which gave to it the completeness desired, was the comment received from the President of the A.D.A., Marcus L. Ward, who stated in a letter received by the committee, "I am glad your society is taking the lead in bringing to the attention of the profession things that are of a literary nature, as well as in the introduction of those that have to do with visual education."

195 Roseville Avenue.

WHO WAS THE OWNER OF THIS BRIDGEWORK?

A SOMEWHAT gruesome find was brought to the office of Sheriff Paul Applegate last Friday when W. I. Prickett, of Pleasantville, Iowa, delivered to the sheriff a lower jawbone which he found while loading sand from the bank along the Des Moines River, near Ora Dell, or Pinchey, an old settlement northeast of Pleasantville.

Examination proved the jawbone to be that of a man, as it was far too large for a female, in which had been inserted by a dentist three elaborate and well made bridges. (Figs. 1 and 2.)

On the right side, the three molars are gone, and the bone shows that they had been extracted for some time. The first tooth present on that side, which forms one abutment of a bridge, is a second bicuspid, the other portion of the bridge being attached to the cuspid. The two lateral incisors carry another bridge, which supported the two central incisors. On the left side of the jaw, the cuspid and first bicuspid are crowned with gold, while the second bicuspid helps to sup-

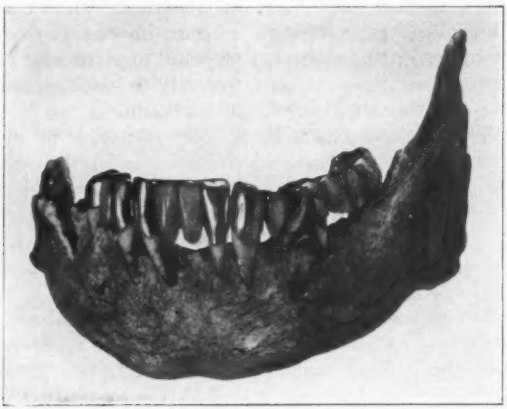


Fig. 1.—Jawbone, labial aspect.

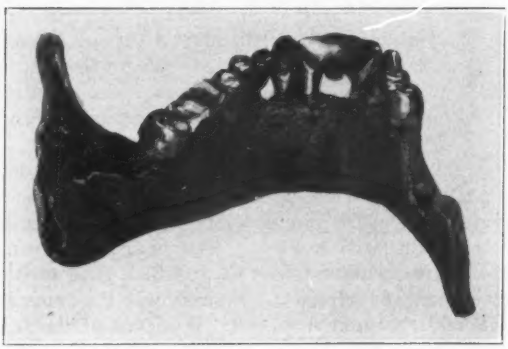


Fig. 2.—Jawbone, lingual aspect.

port a four-tooth bridge of gold, the posterior portion being attached to the third molar.

The jawbone appears to have been in the water for a number of years, and those who saw it believed that the body from which it came must have been in the water at least ten or twelve years. No other bones of any sort were found near the spot where the specimen was found.

It is barely possible that the dentist who constructed the bridges may be able to recognize his work and thus aid in the identification of the owner.

GEORGE H. LANKELMA, D.D.S.,
Citizens National Bank Building,
Knoxville, Iowa.

REQUEST FOR AID IN IDENTIFICATION

HEREWITH is a dental chart of an unidentified corpse of a white man who committed suicide by hanging at Silver Lake, Clayton, N. J. The body was found June 16. As identification has not been possible owing to the state of the body, it is hoped that publication of the dental chart will lead to identification through recognition of the dental work by the dentist who did the work. Communications should be addressed to the Bureau of Identification, State House, Trenton, N. J.

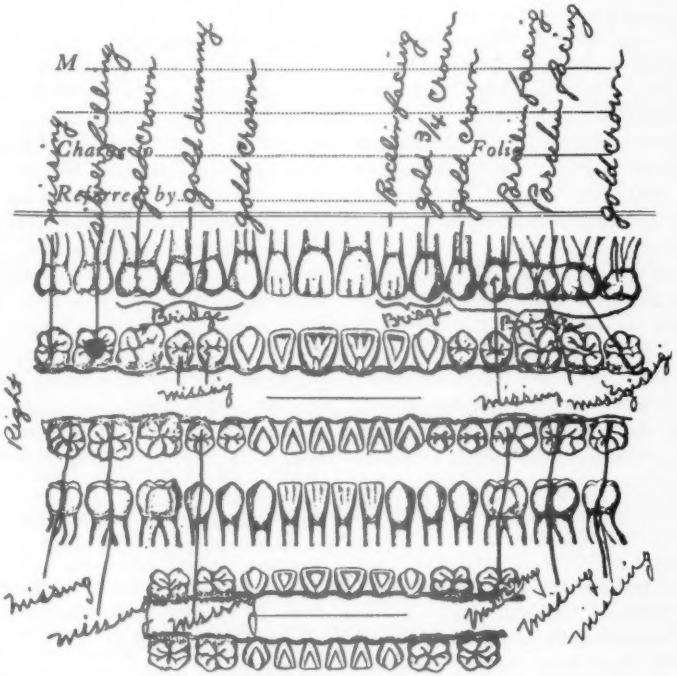


Chart of teeth in case for identification.

R. A. SNOOK, *Supervisor,*
Dept. of State Police,
Trenton, N. J.

DENTAL ECONOMICS

THE DENTAL ASPECT OF WORKMEN'S COMPENSATION INSURANCE

By SAMUEL R. LEWIS, A.B., J.D., Chicago, Ill.

WORKMEN'S compensation legislation has been in effect for a number of years and has come to be accepted as an essential part of industrial organization. There is comparatively little discussion of the subject today as compared to a few years ago. Nevertheless, the history of, and experience with, workmen's compensation should receive serious consideration in the present discussion of voluntary and compulsory sickness insurance projects because of similarity in organization, operation and purpose.

The majority of workmen's compensation laws were enacted during the period from 1910 to 1920. Since that time, all but two of the remaining states have adopted such laws.[1] At the times when most of these laws were being considered, there was little discussion of the possibility of preventing accidents or providing medical care to reduce the period of disability. Although both of these aspects were included in most of the laws, the greatest interest centered in the disability provisions and methods of administration of the acts. This was undoubtedly because of the desire to eliminate the unsettled and inequitable conditions which had existed from the beginning of the rapid industrial development of the past seventy-five years.[2] These conditions became critical shortly after the courts finally repudiated the legal concepts which they had been applying to cases arising under modern industrial conditions, although these concepts had been developed under the very different working conditions of the preindustrial revolution period.[3] The result of this use of outmoded ideas of employer liability was to prevent employes who had been injured through no fault of their own from obtaining judgments against their employers.

The abandonment of these worn-out legal theories resulted in a flood of litigation, brought by injured employes against their employers. The employers, in order to protect themselves against judgments for large sums, took out insurance policies against such claims. It then became the task of the insurance companies to defeat

1. Mississippi and Arkansas do not. A bill to establish workmen's compensation in Arkansas this year was not enacted.

2. Medical Relations Under Workmen's Compensation Revised (Report Prepared by the Bureau of Medical Economics). Chicago: American Medical Association, 1935, pp. 7-27.

RUBINOW, I. M.: Quest for Security. New York: Henry Holt & Co., 1934, ch. VII-X.

Encyclopedia of Social Sciences, Vol. 15, pp. 488-492, and appended references.

EPSTEIN, A.: Insecurity, a Challenge to America. New York: Random House, 1936, Part VIII.

3. For a discussion of these legal theories, see GREEN: Duty Problem in Negligence Cases (1929), 29 Columbia Law Review, p. 255 at 260.

the employes' claims, and they used every available means, with considerable success. It was this unpleasant situation which distracted the attention of the employes, employers, insurance companies and governmental agencies from the more important questions of reduction of accidents and provision of medical care.

It was not long after the enactment of the laws that the importance of safety campaigns and devices for prevention of accidents came into prominence. The value of providing competent and immediate medical, dental and hospital service, as an economically sound way of reducing the total cost of compensation, has also received an increasing amount of consideration. It does not seem improbable that these services will continue to increase in importance and to receive correspondingly larger proportions of the available funds. Cash compensation payments will always have to be paid in some cases, but the benefits of prevention and medical care should greatly reduce the number of payments and total costs of compensation.

NUMBER OF DENTAL CASES IN COMPARISON TO NUMBER OF MEDICAL CASES

Since medical services are of increasing importance in workmen's compensation, the amount of dental service being rendered under the acts at the present time is deserving of consideration. There has been little information collected on this subject, but, from reports requested from the commission in each state, it is evident that dental care constitutes a very small part of the total medical service. Complete information cannot be presented because a number of the states maintain no adequate statistical records. Of the states that do maintain records, a number do not keep separate records

TABLE 1.—YEARLY NUMBER OF CASES*

State	Dental	Medical
Arizona†		
Colorado‡		
Delaware	50	10,000
Florida	#	37,020 (approximately)
Georgia	133§	37,199
Kentucky	28 (no face or jaw injuries included)	12,680
Maine	25	14,000
Nebraska	55	17,410
North Carolina	144**	40,521
Oregon	162 (average)††	30,000-50,000 per year
West Virginia	50-75	30,417
Wyoming	15	
Wisconsin	18	20,383

*Most of these figures are for 1938.

†"We estimate 1-2 per cent."

‡"Considerably less than 1 per cent."

#Head and face injuries, which include dental injuries, were 0.3 per cent of total injuries.

§Thirteen upper jaw, thirty-one lower jaw, eighty-nine teeth injuries.

**$240 compensation paid, $4,963 dental cost.

††Total expenditures for dentures amounted to 1.99 per cent of aggregate compensation payments. This includes many extractions and replacements of infected teeth in treatment of sprained backs, in which teeth were not directly involved.

for dental cases. However, some states were able to report fairly accurate figures regarding the number of dental cases handled yearly. From these figures, the conclusion can be drawn that dental cases total about 0.25 to 0.5 per cent of the medical cases (Table 1), and are so few numerically as not to be susceptible of extended analysis. In states which have a large number of industries, and hence a considerable number of accidents, the dental cases may be numerous, but they are still only a small part of the whole field of medical service.

This is not meant to imply that dental service is unimportant or will not become more important in the future. There are many aspects of workmen's compensation that should be studied for reasons entirely aside from the present situation concerning the amount of dental service provided.

EXTENT OF DENTAL SERVICES

The compensation commissions in practically all of the states report that service is provided for employes who have suffered accidental injuries to the teeth and jaws which require the attention of a dentist. The service provided includes practically any type of dental care that is needed. The amount of service is limited by the compensation acts on the maximum amount which shall be paid for medical service in any one case. The amounts vary a great deal in the different states. In California, Colorado and Tennessee, the cost limit is $100; in Wyoming, Kentucky and Maryland, $200; in Florida, $250. If

TABLE 2.—STATE OF MISSOURI WORKMEN'S COMPENSATION, REVISED BULLETIN NO. 3

RATINGS FOR LOSS OF TEETH

Permanent partial disability.—Loss of teeth shall be rated as permanent partial disability in lieu of all other compensation therefor, except disfigurement and that provided in Section 3311 of the law (medical, etc.), and compensation shall be paid for the periods set forth below. Each cutting, eye or wisdom tooth shall be counted as one tooth, and each molar or grinding tooth as two teeth.

Disfigurement.—In addition to all other compensation, loss of front teeth shall be rated as disfigurement in an amount sufficient to cover the reasonable cost of artificial teeth.

Number of Teeth	Weeks Compensation	Number of Teeth	Weeks Compensation	Number of Teeth	Weeks Compensation
1/8	0.16	13	16.25	32	40.00
1/4	0.31	14	17.50	33	41.25
1/3	0.42	15	18.75	34	42.50
1/2	0.63	16	20.00	35	43.75
2/3	0.83	17	21.25	36	45.00
3/4	0.94	18	22.50	37	46.25
7/8	1.09	19	23.75	38	47.50
1	1.25	20	25.00	39	48.75
2	2.50	21	26.25	40	50.00
3	3.75	22	27.50	41	51.25
4	5.00	23	28.75	42	52.50
5	6.25	24	30.00	43	53.75
6	7.50	25	31.25	44	55.00
7	8.75	26	32.50	45	56.25
8	10.00	27	33.75	46	57.50
9	11.25	28	35.00	47	58.75
10	12.50	29	36.25	48	60.00
11	13.75	30	37.50		
12	15.00	31	38.75		

surgical care is required, the cost is limited to $500. Other states have similar limitations, while some of the laws do not impose any limitations.

Accidental injuries which result in loss of teeth will, in most states, entitle the employe to artificial replacements. In some of the states, this replacement is specifically required by the compensation law; in others, the courts have required it to be provided by interpreting phrases similar to "such medical, surgical or other . . . treatment . . . and apparatus as the nature of the injury might require"[5] as definitely including replacement of teeth. In several states, even though it is not specifically provided in the law or "read in" by the courts, the Compensation Commission allows payment for dental service necessary for replacement of lost teeth.[6]

The causal relationship between industrial accidents and dental or maxillofacial injury is a subject the study of which might afford some valuable information and help to clarify a number of cases in which dental service might not be provided because this causal relationship was not evident. In a recent article on the subject, "Dental Care of Compensation Cases," Malcolm W. Carr recommends the establishment of a compensation board of the Dental Society of the State of New York which will have as one of its duties the study of this relationship.[7] The number of dental compensation cases in New York would probably be sufficient to make such a study feasible and justify such an activity. Furthermore, it should afford evidence of a relationship between accidents and dental injuries that would be of value not only in New York, but in other states as well. In most of the states, the number of cases is so small that it would hardly be worthwhile to make this a major activity, although such a board could be valuable in arbitration of disputes and other phases discussed subsequently.

The employe is not generally entitled to compensation in addition to dental service, although a few states do provide such compensation. In Missouri, the loss of teeth is rated as a permanent partial disability and benefits are paid in accordance with the number and type of teeth lost. (Table 2.) In New Jersey, four weeks' compensation is paid for each tooth lost. Some of the other states will pay compensation if actual and permanent disfigurement is involved, but the great majority of the states do not pay any compensation.

If compensation payments were intended only to provide subsistence for injured employes while they were incapacitated for work, there would probably be little occasion to pay compensation benefits for dental injuries because they seldom result in the loss of a great deal of time. However, compensation payments are not made solely for loss of working time, but also because the employe has suffered an injury which has impaired his health and which may result in loss of earning capacity in the future. Dental injuries suffered in industrial accidents should entitle the employe to compensation benefits just as other injuries do. That they are not given such benefits is surprising in view of the fact that the loss of teeth can be a far more serious injury than the loss of "one phalanx of a toe." This type of injury is specifically provided for in all of the acts. While artificial teeth are unquestionably far more serviceable substitutes than artificial limbs or eyes, the employe has suffered a serious loss which may expose him to future injury and expense. The recognition of the seriousness of this loss should be extended to other states,

5. New York, Belmont v. Paramount Publix Corp. 246AD661. A similar decision was rendered in Nebraska.

6. Iowa and Minnesota among others.

7. *New York J. Dentistry*, 8:329, October 1938.

TABLE 3.—WORKMEN'S COMPENSATION FEE SCHEDULE

Work	Kansas	Nebraska	North Carolina	Ohio	Utah	Washington	Wyoming	Oregon	West Virginia*
Extractions									
Simple extraction	$2	$2	$1	$2	$2	$2	$2	$1 per tooth	$2
Each additional extraction	$1 up to ten teeth	$1	$1	$1	$1	$1 ($10 maximum)	$1		$1
Impacted tooth	$5	$15				$20	$10		
Anesthesia:									
Local	†		$1 add.		$3–$5				
General		$5–$10 add.	$5 (1- 5 teeth) Each add. to 19 $1	$5–$10	$5–$10				
Fillings									
Type									
Amalgam									
Pit cavity	$1		No fees scheduled			$2	$3		$2
2 surface	$3	$3		$3	$4	$3	$4		$3
3 or more	$4 $5 (extensive restoration)	$5		$5	$6	$4	$5		$3
Inlays:									
Gold						Single surface $5			
Malleted or cast						Lingual dovetail $8 Incisal step $8			
Mesio-incisal or disto-incisal	$6	$12		$12	$15	M.O. or O.D. $10	$6	$8 each	$6
Cavities involving 3 tooth surfaces	$10	$15		$15	$20	M.O.D. On bicuspids or molars $12.50	$10		
Silicate	$6	$4		$5	$6	$3	$4		$3
Cement base in cavities other than for silicate		$1		$1	$2				

*Minimum fee schedule of Kanahwa Valley Dental Society.
†Included in fee for extraction.

Cement base in cavities other than for silicate		$1		$1	$2				$3

*Minimum fee schedule of Kanahwa Valley Dental Society.
†Included in fee for extraction.

Dentures

Type	Utah	Washington	Wyoming	Oregon	West Virginia
Vulcanite plates (Upper or lower)	$50	$25	$30 (full) Condensite or bakelite $50	$25 full upper $20 full lower	$50 both
Partial vulcanite plates (Upper—gold clasps)	$50 (more than 4 teeth)	$25	$30 (plus $5 per clasp)	$30 partial—3 or more teeth	$35 (2 clasps)
(Lower with gold lingual bar and gold clasps)	$25 (less than 4 teeth where teeth approximate each other) Clasps each $6 Lingual bars $12 Palatal bars $14	Dummy teeth $10			Lingual bar-plate with 2 clasps $35
Rebasing	$15 full or partial denture				
Repairing	Simple break $3 Replace 1 tooth $2 Add. teeth, each $1				

Dentures

Type	Kansas	Nebraska	North Carolina	Ohio
Vulcanite plates (Either upper or lower)	$25	$35	Preparing mouth $20 Inserting plates $25	$40
Partial vulcanite plates (Upper with gold clasps)	$25	$35 upper or lower, more than 4 teeth	Per tooth, abutments counting same as teeth, 6 anterior teeth $10	$40 (more than 4 teeth)
(Lower with gold lingual bar and gold clasps)	$35	$25 upper or lower, 4 teeth or less Gold clasps each $6. Gold bars each: Lingual, $12. Palatal, $14	Per tooth, bicuspids & molars $12.50. One tooth on rubber $10 Add. to 5 $1. Lingual bar plates bent clasps $40	$25 (less than 4 teeth where teeth approximate each other) each Gold clasp $6. Gold bars lingual $12. Gold bars palatal $14
Rebasing		$15 full or partial denture		$15 full or partial denture
Repairing		Simple break $3. Replace 1 tooth $2 Add. teeth each $1	Replace 1 tooth $3. Add. $1	Simple break $3. Replace 1 tooth $2 Add. teeth each $1

(Continued on next page)

Crowns and Bridgework

Type	Kansas	Nebraska	North Carolina	Ohio	Utah	Washington	Wyoming	Oregon	West Virginia
Gold shell crowns bicuspids	$10	$12	No fees specified	$12	$12	Abutments, shell crowns $10	$15	$9 per tooth including crowns used as abutments	$9
Molars	$15	$15		$15	$15				$10
anterior	$7.50	$12		$12	$12				$8
Porcelain crowns	$8	$10		$12	$12	Anterior crowns with porcelain fang $15	$15	All $10 each	$10
Porcelain crowns with gold base	$15	$15		$15	$15	Abutments, porcelain $10			
Porcelain jacket crown	$12 (with alloy base)	$30		$35	$50	Davis crown $10 Davis cast base $12 Richmond crown $12	Jacket crown $35 Davis crown $12 ¾ crown $15		Richmond crown $15 Open faced crown $8 ¾ cast crown $15 Full cast crown $20
Pontics		$10		$10	$10	Porcelain jacket $30	$10 per tooth $15		Gold crowns (on plates) $8
Pontics where porcelain root end is used		$15		$15	$20	Dummies $10	Dummies $6		Bridgework per tooth Anterior $9. Bicuspid $9. Molars $10
¾ gold crown or Carmichael attach.		$15		$15	$20				

Other Services

Type	Kansas	Nebraska	North Carolina	Utah	Washington	Wyoming	Oregon	West Virginia
Removal of pulp & filling root canals								
Single rooted	$3	$5		$7.50	$3	$5		$5
Multirooted	$5	$10		$15	$5	$8		$5
Prophylaxis		$5		$6–$15				$10 (4 sittings)
Roentgenograms								
Single film		$2	$2	$3	$1	$2	$1	$3 (2 add.)

Other Services—(Continued)

Type	Kansas	Nebraska	North Carolina	Utah	Washington	Wyoming	Oregon	West Virginia
Complete series		$12		$15	$7.50		$7.50	$15
Lateral jaw		$5		$5	$5	$10		
Anesthesia		$5–$10		$5–$10		$1		$2
						$5		
						$10		
Fractures,								
(a) Single	By case			By type of case	$20 — no displacement	$75		
Lower jaw		$65	$75			$100 compound		
Upper jaw		$35			$50 — with displacement			
(b) Postoperative treatments		$2						
(c) Reduction of dislocation of mandible		$12.50				$10		
(d) Metal or vulcanite splints						$40		

if the purposes of workmen's compensation acts are to be consistently carried out.

CHOICE OF DENTIST

Freedom of choice on the part of both patient and doctor has always been a fundamental tenet of the medical and dental professions. In the drafting and administering of workmen's compensation laws, this principle received little consideration, and in the early years of compensation, it was largely ignored. Over the period of years since the original laws were adopted, there has been some improvement in this respect, but it is still true that, in a large number of states, the employe is not permitted to choose his physician or dentist. In reply to the question, "Does the employer or the industrial commission determine which dentist shall do the work?" approximately half of the states said that the choice is made by the employer or insurance carrier. In the remainder of the states, with the exception of one or two in which the commission makes the choice, the employe is permitted to select his own dentist.

The question of free choice has never become so serious in connection with the dental phase of workmen's compensation as with the medical.[8] This can probably be attributed to the fact that dental cases are relatively few and inexpensive, and the average employer does not have enough occasion for the services of a dentist to establish any contractual or permanent relationship for taking care of dental cases, and therefore neither the employers nor the insurance carriers are vitally interested. Furthermore, dental services have increased in importance since the first laws were adopted and have benefited by the improvements in the laws since that time.

There is little evidence in the dental

8. For a discussion of the medical aspect, see reference 2 (Ch. V).

literature of any sizable discussion of this question in connection with workmen's compensation. Either method, free choice or employer's choice, can be greatly abused, and the tendency appears to be toward the establishment of working relationships on various in-between grounds.[9] In a number of states, the medical societies and other interested groups have approached mutual understanding and cooperation on this question, usually beginning with the formation of medical committees to adjust disputes over medical bills. These committees have usually functioned quite satisfactorily and have led the way to adjustment of other disputed questions.[10] This rapprochement has progressed so successfully that, in some states, the entire responsibility for the quality of medical care has been placed upon the state and county medical societies. In New York, such a provision was incorporated directly in the compensation law.[11] In other states, virtually the same result has been attained without resort to legislation.

The success of the assumption by the medical society in New York of responsibility for the quality of service was undoubtedly in the mind of the writer of the article previously referred to[7] when he recommended that similar responsibilities be undertaken by the dental societies. The article states that the proposed dental compensation board would also be expected "to act as a temporary qualifying board which would, after investigation, allocate proper designation and rating to members of the dental profession, in accordance with the ability and professional standing based upon known affiliations and field of specialization of individual members who apply for listing in the compensation registry."[12]

Such a suggestion must be recognized as a compromise between absolute freedom of choice and the alternative of no freedom at all. However, it is far more satisfactory than the situation in which the employer provides the dental service. It demands recognition of the fact that there are incompetents in every profession and gives the employer the right to ask that they be eliminated from participating in this work as far as possible, but it gives the profession the right to perform the task.

Since the New York law appears to have been quite successful, and the same relationship, without legislation, has been adopted in other states in relation to medical care, it would seem that it could also be applied to dental care. However, there are several differences which will probably have an influence on the adoption of such a plan by the dental societies. The first is the fact that dental care is at present such a small proportion of the total. In a number of states, there are hardly enough cases to justify the creation of such a board. This will hold such a development back in some states, but would not apply to New York. Secondly, the medical committee or board in charge of compensation has a much easier time certifying specialists than the dental board would probably have, because the qualifications are, as a general rule, much better established. This difficulty can undoubtedly be overcome, although the early periods of certification may well be somewhat unsettled.

Adequate provision must be made for appeals by dentists who feel that they have been unfairly treated by the certification board. The process of obtaining certification should be made as simple

9. Medical Relations Under Workmen's Compensation (Development Since 1930). Chicago: American Medical Association, 1938, pp. 19-28.

10. *Ibid.*, pp. 18-19.

11. Medical Abuses Act, 1935.

12. Reference 7, p. 330.

as possible and standards of competence should be clearly outlined.

Other states which have compensation problems, either at the present time or in the future, will probably work out differing methods of solving them. The creation of compensation committees of the state societies at the first evidence of difficulty would probably be wise. From that point, the progress of cooperative efforts may proceed in a number of ways.[13]

FEE SCHEDULES

The development of fee schedules is another interesting aspect of the dental phase of workmen's compensation. Nine states have adopted such schedules in the last ten years (twenty-one states have adopted medical fee schedules) and, as is the case with many other particulars of this subject, there are conflicting opinions concerning their value.

One of the chief difficulties with such schedules is that they tend to standardize fees. Since the variation between the amounts charged by dentists in the cities and those in the country has a very reasonable basis in costs of operation and living, entirely aside from individual competence, it is easy to see that fee schedules may cause difficulties if not properly handled. Furthermore, there are dentists who are well satisfied with the fees that they now receive for compensation work without schedules, and who believe that the adoption or agitation for a fee schedule would upset this harmonious balance.

On the other hand, a fee schedule can be of great value in eliminating arguments and bargaining over fees. The individual does not have to stand alone against powerful agencies interested in reduction of costs. Most of the states which have dental fee schedules report that they are well satisfied with their operation and that the whole problem has been simplified. A fee schedule tends toward elimination of situations such as exist in some states where the dentists turn in estimates of twice their normal fees because they know that the commission always cuts the fee in half. In these states, dentists who are not aware of the situation will receive inadequate payment as long as they are inexperienced; whereas others who have had long experience with the system can treble their usual fees and make an unreasonable profit on their compensation cases. It would be far better to recognize the existence of such a situation and establish a schedule of reasonable fees which would tend to eliminate the mutual distrust and prevarication which exists under the present arrangement.

While fee schedules undoubtedly tend to stabilize fees, they do not necessarily tend to make the lowest fee the standard for the state, as sometimes has been stated. For example, the fee schedule in Nebraska has been increased rather than decreased over the original fee schedule. It is, of course, essential that the dental society take an active part in the adoption of all schedules and not assent to unsatisfactory ones, because there are always influences working toward reduction in costs and medical services are probably most subject to change. The possibility of schedules being adopted without the consent or advice of the dental society is another reason for a permanent committee to deal with such questions. In this connection, a dental compensation board would be valuable in assisting the Industrial Commission to arrive at an acceptable schedule.

In the states which have already adopted schedules, the reasons for adoption have been somewhat varied. In one state, a labor union proposed the idea and forced it through the legislature,

13. Reference 2, pp. 19-28.

because the union members were interested in obtaining dental service. In another state, the Industrial Commission supported the idea because it was interested in having some uniform standard established. In most states, however, the dental society was an active factor and assisted in drafting the fee schedules which, on the whole, provide quite satisfactory fees. (Table 3.)

Since most of the states which have fee schedules seem to feel that they have accomplished something in the way of improvement and have not had a great deal of opposition in having such schedules adopted, it would appear to be indicated that a number of other states consider the possibility.

FUTURE DEVELOPMENTS

The similarity between workmen's compensation and other forms of social insurance suggests that the experience gained in dealing with the compensation problem may be of great value in the future. The increasing amount of discussion and activity in the field of sickness, unemployment and old-age insurance indicates the need for study and development of fee systems and regulations which are considerably different from private practice relationships.

The experience gained in dealing with the faults of the original compensation laws should be utilized to the fullest in any legislation that may be enacted in the future. Political appointments and reduction in professional remuneration are anticipated concomitants of compulsory sickness insurance if such legislation is ever passed. These abuses would undoubtedly develop and could probably be mitigated over a period of time, but they can be lessened right from the start if the experience with workmen's compensation can be forcefully depicted and the necessary improvements be demanded.

The outcome of the question of compulsory insurance cannot be predicted, but the possibility of the enactment of such legislation should not be overlooked. The fact that in a number of states the insurance carriers have come to recognize the professions as the most competent and capable agencies for evaluating and regulating their own service would appear to be an encouraging sign that slow progress can be made. The adoption of fee schedules and certification and the expansion of dental services (under workmen's compensation) should be actively supported by the dental societies because this will serve the immediate purpose of improvement in the operation of these laws and will also offer an excellent proving ground for professional participation in any future legislation of a similar character.

212 East Superior Street.

NINETY-SIX PER CENT OF CHILDREN EXAMINED IN SCHOOL PROGRAM FOUND TO HAVE CARIOUS TEETH

In the results of the examination of more than eight thousand school children, only 322 were found to be without caries or fillings. This fact was made known by the release of a summary of findings in the school examination program which is being carried on in the twelve city schools by the Chicago Board of Education, Chicago Board of Health, the Chicago Dental Society and the Mouth Hygiene Council.

In the deciduous teeth were approximately 1,300 defects and in the permanent teeth, approximately 1,600. Each child, to reduce these figures to the individual, has 4.3 cavities in a total of 35,682 cavities in the 8,315 children.

CURRENT LITERATURE

Vesicular Pharyngitis and Stomatitis

By H. D. Levine, S. O. Hoerr and J. C. Allanson

During the months of July and August 1938, an epidemic of febrile vesicular pharyngitis and stomatitis broke out in three summer camps located near a lake in central New Hampshire. The disease, affecting 106 persons, was characterized by a high infectivity, a benign, uncomplicated course of four to five days and the presence of vesicular lesions in the throat and sometimes in the oral cavity. The chief signs were fever (never more than 104°) and the appearance of vesicles which subsequently ulcerated. Many of the cases seen at one camp (but none in the two other camps) presented lesions on the buccal mucosa or the gum near the dentogingival margin. Cultures and direct smears of the lesions show a preponderance of pneumococci. That the disease is of herpetic origin seems probable, but the authors failed to demonstrate a virus.—*J.A.M.A.*, 112:2020, May 20, 1939.

M. K. Hine.

Leukoplakia in Young Adult

A physician from California writes to the *Journal of the American Medical Association* regarding a woman 24 years of age with an extensive and persistent case of leukoplakia. The editor of the Department of Queries and Minor Notes discusses the case as follows:

In the majority of cases of leukoplakia buccalis no ill effects occur. While leukoplakia is regarded as precancerous, a malignant change need not necessarily follow even after many years. Therefore, in most instances, no radical treatment need be considered. Of course, the patient's mouth should be inspected at intervals of six months to apprehend any unfavorable changes in the lesions.

There should be an investigation as to the presence of syphilis, which should receive standard treatment if present. Some investigators state that in fully 50 per cent of patients with leukoplakia, there is a background of syphilis. Otherwise, the patient should not smoke at all. The food should not be highly spiced, very hot or cold. Soothing applications may be made to the lesions, such as tincture of myrrh. Silver nitrate crayons may be used on fissures and erosions, but great care should be taken not to stimulate an already present epithelioma by such superficial caustic applications. Acid mercuric nitrate has been much used, but its action must be strictly confined to the lesions. For local thickenings and irregularities, the cautery is best. If malignant change takes place in any of the lesions, it is treated the same as cancer of the mouth otherwise.

In a patient as young as this woman, leukoplakia is unusual. One should use care to make sure that she does not have lichen planus limited to the mucous membranes, instead of leukoplakia.—*J.A.M.A.*, 112:2085, May 20, 1939.

Dental Sepsis in Relation to Anemia, Dyspepsia and Rheumatism

By J. M. Vaizey and A. E. Clark-Kennedy

The writers investigated the postextraction histories of 234 outpatients who had all of the teeth extracted, for a variety of reasons. Seventy-six of these patients had had dyspepsia which was believed to arise from dental sepsis. Six were benefited by extraction of all teeth. Of thirteen patients who had suffered from rheumatic symptoms, only five benefited from full-mouth extractions. In 126 cases in which the teeth were extracted for purely dental reasons, thirty-nine patients developed dyspepsia and nineteen developed symptoms of rheumatism.

The authors believe that the mechanical factor of inadequate masticatory mechanism is more important than the septic factor in the pathogenesis of dyspepsia and rheumatism.—*Brit. Med. J.*, 4094, 1939.

Frank Allen.

Two Cases of Pellagra Treated with Nicotinic Acid

By R. France, R. D. Bates, W. H. Barker and E. Matthews

Two cases of pellagra are reported in which the administration of nicotinic acid, intramuscularly, appeared to effect remissions as regards the lesions of the skin and mucous membrane. Stomatitis rapidly disappeared, and the mental and physical conditions of the patients improved. Electrocardiograms indicated a return to normality in one patient. Normal hydrochloric acid reappeared in the gastric juice of the other within a week after therapy. The low cost of the nicotinic acid, as compared with that of liver extract, yeast, wheat germ and other therapeutic agents is stressed. The method of administration is important in cases where feeding has become a problem.—*Johns Hopkins Hosp. Bull.*, 63:46, 1939.

Virgil D. Cheyne.

Epithelioma of the Lip

By L. J. Carter

This paper reports the results of treatment (1 to 15 years postoperatively) of seventy patients having epithelioma of the lip. Treatment consisted of surgical procedures, x-ray or radium therapy and combinations of the three.

Thirty-four cases of a simple type (lesion not more than 1 cm. in diameter and symptoms which had been noted for less than a year with no palpable glands) resulted in 100 per cent cures. Treatment of a more advanced type of epithelioma (those in which the lesions were more than 1 cm. in diameter or had lasted for more than a year with no palpable glands) accomplished cures in nineteen of twenty-four cases reported. In cases in which palpable glands were present, seven cures followed treatment of twelve cases. The author stresses early treatment.—*Canad. M. A. J.*, 40:570, 1939.

Frank Allen.

A Report of Ovarian Dermoid Cyst Containing Two Teeth and Microscopic Findings Regarding the Teeth

By Waldmann-Kranichfeld

The author made a thorough study of an ovarian dermoid cyst which was surgically removed from a 21-year-old woman who came to the university clinic in Jena. The ovary was grossly enlarged. An x-ray examination revealed two distinct teeth and considerable bone in the wall of the ovary. The outer surface was smooth and whitish. Complete histologic studies were made of the two teeth. They resembled deciduous teeth in size and shape. One was in a more advanced stage of development than the other, but neither had completely formed roots. The teeth were enclosed in a thin sac which was closely applied to the wall of the ovary. Examination of one of the teeth revealed a thick layer of bone in the pulpal region which resembled maxillary bone in size and shape. Outside the tooth sac, a small polyp was found hanging by a short stalk from the wall of the ovary. It was extremely cellular, contained a small portion of bone and was infiltrated with chronic inflammatory cells.

Histologic study of the teeth revealed completely formed crowns. The enamel was very thick and the dentin appeared to be quite normal. Against the surface of the enamel were found remnants of epithelium which appeared to be fragments of the enamel organ. A well-formed odontoblastic layer was found in its normal position. The pulp was very cellular and slightly vascular, and appeared to be in an embryonic state of development. Both the dentin and the enamel were of normal structure and there was no evidence of a destructive process. The teeth were not attached to the bone, but did show a tendency to erupt through the tooth-sac wall.—*Deutsche Zahn-, Mund- u. Kieferheilk.*, 6:263, 1939.

Virgil D. Cheyne.

Dental Caries Among Eskimos of the Kuskokwin Area of Alaska—Part III

By Theodore Rosebury and Maxwell Karshan

The diets and dietary habits of three groups of Eskimos were studied extensively. The first group, living on a primitive diet, had very little caries. A second group, in contact with a white trading post, had a great deal of caries. The third group was made up of children living in an orphanage. Although the influence of the white man's diet is extensive among the children of this group, the caries incidence is intermediate.

No correlation between carbohydrate, protein, fat, calcium, phosphorus and vitamin D intake and the occurrence of caries could be established, although they may play a secondary rôle in its etiology.—*Am. J. Dis. Child.*, 57:1343, 1939.

J. VOLKER.

Esophagitis in Infancy

By J. H. EBBS

TWENTY-EIGHT cases of esophagitis in infancy are reviewed briefly in this article. Twenty-two of these were caused by thrush. In the clinical syndrome, the outstanding signs and symptoms were the presence of oral thrush, refusal to take foods, vomiting during or soon after feeding, severe toxemia, with pallor and weak pulse and, in some cases, the presence of blood in the vomitus and, in a few, melena. The pathologic process was one of ulceration of the epithelium and invasion of the submucosa by the mycelium of the thrush fungus. Two cases of diphtheria of the esophagus, one case of tuberculosis and one due to the presence of Vincent's organisms were found. Three cases have been classified as non-specific in which there were ulcers at the lower end of the esophagus and pain during or after feeding. Local treatment of oral thrush with gentian violet appears to be satisfactory, and one case of esophagitis is described which appeared to respond to this form of treatment. Thrush is not the benign condition which it is commonly thought to be.—*Arch. Dis. Childhood*, 13:211, 1938.

VIRGIL D. CHEYNE.

A Study of the Behavior of the Pulp After Experimental Fracture and Retention of the Root Fragment

By G. R. BUGLIARI

THIS work is a further contribution to the study of the recovery of exposed pulps after root fracture. The author briefly illustrates his histologic research on the fate of experimental fractures when the roots are allowed to remain in the alveolus. Microscopic and radiologic findings are presented eight weeks after the disturbance. A normal connection between the alveolus and periodontal membrane is found, and vital pulp tissue is present in the unimpaired fragment. The fracture did not disturb the pulp and dentin connection, and from this a new growth of dentinoid was shortly built. Old and new opinions concerning the vitality and repair of the pulp are discussed. The viewpoints and reports of other investigators in the literature regarding spontaneous consolidation after fracture are cited.—*Ztschr. f. Stomatol.*, 37:25, April 1939.

VIRGIL D. CHEYNE.

Malignant Parotid Tumor of the Newborn

By H. A. MCKNIGHT

THE author reports the occurrence of a parotid tumor in a child 15 months of age. The neoplasm was reputed to have been present at birth. Surgical removal, followed by x-ray treatment, was used in a futile attempt to prevent death. Necropsy revealed extension to the skull via the auditory canal, facial canal and temporal bone. Biopsy established the growth as an adenocarcinoma. —*Am. J. Surg.*, 45:128, 1939.

J. VOLKER.

Surgery of the Cleft Palate

By A. SMITH and J. JOHNSON

THE incidence of cleft palate among white children is about one cleft per thousand births. It is slightly lower for colored children, about one cleft per 1,800 births. The incidence among boys is higher than among girls. Although obturators are of some service, the ideal correction is surgical closure of the hard and soft palate. When a cleft lip is present, it should be repaired soon after birth. The palate may best be repaired at 3 or 4 years of age. A long flexible velum is necessary for normal speech and voice training is indicated in most cases.—*Am. J. Surg.*, 45:93, 1939.

J. VOLKER.

Human Bite Infections

By P. E. MCMASTER

A SERIES of sixty-eight cases of infection caused by wounds from human teeth are reported. Superficial wounds, if left open, healed without complications. Deep wounds resulted in serious complications. Osteomyelitis, abscess, tissue necrosis and tendon sloughing were common. Nine amputations

of infected parts were necessary. A total of forty-one cases were studied bacteriologically. Both the fusiform bacillus and spirochete of Vincent were found in ten of these cases. Eleven other cases showed the fusiform bacillus. *Staphylococcus albus* was found commonly. Hydrogen peroxide and sodium perborate were more effective therapeutically than were hot wet packs.—*Am. J. Surg.*, 45:60, 1939.

J. Volker.

Monilial Stomatitis

By R. D. Moyle

In a case of suspected lichen planus, the tongue had been sore for three years and was nearly coated with membranous white patches with bright erythematous margins. White patches of membrane present on the gums and over the buccal mucosa could be easily removed with a spatula. There were no other lesions on the body and the general health had been excellent. Microscopically, the membranes consisted of a network of long nonseptate mycelia and débris. Thorium X was advised for treatment.—*Proc. Roy. Soc. Med.*, 32:726, 1939.

M. Van Kesteren.

Bacteriemia and Oral Sepsis

By S. D. Elliott

Transient streptococcal bacteriemia is a frequent sequel to tooth extraction, especially when the mouth is the seat of a severe chronic gum infection. Both infection and trauma are involved in the production of postoperative bacteriemia. When mouth infection is marked, even slight degrees of gum injury are sufficient for blood-stream invasion. In the complete absence of trauma, the "rocking" of a tooth during its extraction causes no bacterial shower in the blood. Usually, transient bacteriemia has no permanent ill-effect, but there is some evidence that in subjects with abnormal heart valves, it may lead to subacute infective endocarditis. Prevention of bacteriemia may be achieved by the reduction or elimination of infection and trauma. By manipulating an infected tooth as little as possible during its extraction, the incidence or degree of blood infection may be decreased.—*Proc. Roy. Soc. Med.*, 32:747, 1939.

M. Van Kesteren.

Inhibition of Blood Clotting: An Unidentified Substance Which Acts in Conjunction with Heparin to Prevent the Conversion of Prothrombin into Thrombin

By R. M. Brinkhous, H. P. Smith, E. D. Warner and W. H. Seegers

Although there remains much uncertainty regarding the nature of reactions which lead to the formation of thrombin from prothrombin, these workers find that the effect of heparin in blocking the conversion of prothrombin requires the presence in the plasma of an accessory inhibitory factor not previously recognized. The use of heparin alone does not block the formation of thrombin and the new factor alone has little inhibitory power. However, the two in combination are highly effective in doing so. The new plasma factor is shown to be nondialyzable, but, aside from this, its identity has not yet been established.—*Am. J. Physiol.*, 125: 683, 1939.

Virgil D. Cheyne.

Sensitization of the Submaxillary Gland by Sympathetic Denervation

By F. H. Simione and J. P. Maes

Increased responsiveness after denervation has been demonstrated for a number of neuro-effector systems. Other workers have determined that the denervated submaxillary gland is an organ peculiarly sensitive to the action of adrenalin. Histologic evidence has supported most of these claims.

Ten adult cats were used in the preparation of the present report and the authors find that chronic denervation of the submaxillary gland of the cat by the excision of the superior cervical ganglion sensitizes the glands to pilocarpine, adrenalin and, less consistently, acetylcholine. Cocaine increases the responsiveness of the normal (acutely denervated) gland, but not that of the gland already sensitized by chronic sympathetic denervation.—*Am. J. Physiol.* 125:674, 1939.

Virgil D. Cheyne.

Mean Annual Hours of Sunshine and the Incidence of Caries

By B. R. East

A group of white boys from 12 to 14 years

old, residing in rural and semi-rural areas of twenty-four states during 1934-1935, was studied. There were 94,337 individuals included in this group, in which the average caries incidence per hundred boys was found to be 353.50. The mean caries incidence varied with the number of hours of sunshine prevailing at the place of residence. The group living in an area having more than 3,000 hours of sunshine per year had 290.50 cavities per hundred boys; the 2,600-2,999 group, 323.00; the 2,200-2,599 group, 375.65, and the 2,200 hours, 485.75 cavities per hundred.

These data suggest an inverse relationship between the caries-attack rate and the mean average number of hours of sunshine recorded for their place of residence.—*Am. J. Pub. Health,* **29**, 1939.

FRANK ALLEN.

Effect of Artificially Induced Hyperpyrexia on Tooth Structure of the Rabbit

By M. BERMAN, L. F. EDWARDS and P. KITCHEN (Introduction by C. A. DOAN)

GROUND sections of incisor teeth of rabbits in which intermittent fever at 106.5° to 108.5° F. had been produced by both radiotherm and Kittering hypertherm were studied. The teeth show linear striations characterized by the presence of numerous uncalcified spaces resulting from a lack of fusion of the individual calcification globules. The degree of interference with calcification, as judged by the size and frequency of the uncalcified spaces, was directly related to the intensity of the induced fever during the early periods of fever excitation. Subsequently, the disturbance becomes less marked. —*Proc. Soc. Exper. Biol. & Med.,* **41**:113, 1939.

L. H. GARRISON.

Treatment of Gingivitis Gravidarum

By LASZLO MOLNAR

IN about 50 per cent of the pregnant women studied, gingivitis accompanied by bleeding from the gum and nose and, in most cases, loosening of the teeth were observed. Gingivitis gravidarum begins most frequently between the fourth and the fifth month of pregnancy and disappears about the second month after delivery.

The author reviews the different apparent factors in the etiology of this condition, particularly nutritional deficiencies and changes in the circulatory system and in the function of the internal glands. In cases of marked hypertrophy of the gingival papillae, excision of the hypertrophied tissue with the electric knife was found advisable. Therapy in the less severe form of gingivitis gravidarum is largely nutritional. Milk products and foods rich in vitamin C and phosphates are recommended. The author found that the use of synthetic vitamin concentrates was not advisable. Ultraviolet radiation gave favorable results in some cases.

It is understood that the most important phase in the treatment of gingivitis gravidarum is the maintenance of a well-balanced diet of natural food products sufficient to meet the increased nutritional requirements of pregnancy.—*Ztschr. f. Stomatol.,* **37**:468, 1939.

R. F. SOGNNAES.

Fixed Eruption and Stomatitis Due to Sulfanilamide

By A. B. LOVEMAN and F. A. SIMON

THE literature is rapidly becoming voluminous with reports of various types of reactions following the use of sulfanilamide. The oral lesions reported by many have never been subjected to an attempt to reproduce the condition. In the case here reported, severe stomatitis and skin lesions followed administration of the drug. There was extensive involvement of the lower lip, beneath the tongue and along the buccal mucous membrane. On each side of the buccal mucosa, the mucous membrane was erythematous and raw looking, with a superimposed grayish white membrane, some of which was hanging in shreds. This resulted from rupture of the bulbous lesions. Normal mucous membrane surrounded the areas of involvement. After the lesions produced by the first administration of the drug had healed, three 5-grain tablets were again given and the lesions recurred, being similar in every detail to those originally observed. Recurrence indicated that the lesions were of a fixed nature, since the same areas were involved in each case. Patch tests given later gave positive results in previously involved areas, but no reaction resulted in areas of normal skin.—*Arch. Derm. & Syph.,* **40**:29, 1939.

VIRGIL D. CHEYNE.

BIBLIOGRAPHICAL

Diseases of the Mouth and Their Treatment.

A Textbook for Practitioners of Medicine and Dentistry. By HERMANN PRINZ, A.M., D.D.S., M.D., D.Sc., Dr. Med. Dent., Professor Emeritus of Materia Medica and Therapeutics, The Thomas W. Evans Museum and Dental Institute, School of Dentistry, University of Pennsylvania, and SIGMUND S. GREENBAUM, B.S., M.D., F.A.C.P., Professor of Clinical Dermatology and Syphilology, Graduate School of Medicine, University of Pennsylvania; Visiting Dermatologist Mt. Sinai Hospital, Philadelphia General Hospital, Home of St. Michaels and Eaglesville Sanatorium; Consulting Dermatologist, Italian Hospital, Etc. Second edition, thoroughly revised. 670 pages, with 324 engravings, and 12 colored plates. Philadelphia: Lea and Febiger, 1939. Price $9.00.

This is the second edition of "Diseases of the Mouth and Their Treatment," the first appearing in 1935. In the short period of four years, a new second edition became necessary in response to the continued demand from the Americas and the Continent for this unique contribution on diseases of the mouth. The authors are well known in medical and dental circles and their contributions are always most welcome. The present edition is an enlarged revision of the first edition and when compared with the former edition impresses one by the thoroughness with which the authors have carried out this new revision.

It is practically impossible for the reviewer to present all the salient features of this unique publication. Suffice it to mention a few of the many good features of this valuable contribution. The authors have included in the new edition most of the worthwhile recent contributions on diseases of the mouth. Of the abundant new material which has been added, particular mention is made of the work of Okell and Elliott on focal infection, Webb's method of employing electrocoagulation in treating parodontitis, the Hand-Schüller-Christian syndrome, hereditary pseudohemophilia, pseudotrichinosis, acrodermatitis perstans, amyloidosis of the tongue, acute ulceromembranous glossitis, nodular myolysis of the tongue, Paget's disease and the use of zinc peroxide. Many sections of the book have been completely rewritten, this making the discussions up-to-date and in keeping with recent researches. Of the numerous newly rewritten material, attention is called to that on the antibacterial effect of human saliva; diabetes; Gaucher's disease; congenital fistulas of the lips, and tumors of the oral cavity. Another salient feature of this edition is the abundance of excellent illustrations. The additional illustrations have increased the number of text figures by thirty-seven. An unusual original colored photograph showing the manifestation of Addison's disease in the mouth has also been included

In their discussions, the authors have considered diseases of the mouth as medico-dental problems. Their book is presented to the medical and dental professions as an authoritative handbook on diseases of the mouth and their treatment. They have masterfully included "the enormous mass of scattered information" pertaining to the subject and have carefully evaluated the various problems, basing their conclusions upon their vast experience as teachers and clinicians. The discussions are accurate, direct and clear and are free from the padding usual to the average textbook.

Students and practitioners of medicine and dentistry will find "Diseases of the Mouth and Their Treatment" a mine of information covering the common and the rare maladies of the mouth. No medical or dental library can be considered complete without the second edition of this valuable book.

E. S.

Histopathology of the Teeth and Their Surrounding Structures

By Rudolf Kronfeld, B.S., M.D., D.D.S. Professor of Dental Histology and Pathology in the Chicago College of Dental Surgery, School of Dentistry, Loyola University, Chicago, Ill. Cloth. 504 pages; 438 illustrations. Second edition. Philadelphia: Lea and Febiger. Price $7.00.

The first edition of this book has been used as a textbook in many of the dental schools in this country, and as a reference work by almost all of those interested in the histology, pathology and biology of the teeth. The progress made and knowledge gained in the last few years in the continued study of the histopathology of the teeth impelled the author to enlarge, rewrite and rearrange the entire book. The grouping was influenced by suggestions in the Report of the Curriculum Survey Committee of the American Association of Dental Schools. The first edition was an excellent book, but the new edition comes closer to being an ideal textbook. There is a commendable effort throughout the text to associate the experimental and the clinical findings on diseases affecting the teeth and the associated soft tissues. The book is very well written and is beautifully illustrated, largely with original photomicrographs of human material. Following each chapter is a well selected bibliography of pertinent literature. Certain new material has been added, including the physiology and pathology of tooth calcification; Hutchinson's teeth; mottled enamel; erosion; focal infection; healing of extraction wounds; diseases of the oral mucosa; tumors of the oral cavity, and the differential diagnosis of toothache. The new section on common diseases of the oral mucosa is too brief and incomplete to be of value in a book of this type. This is also true of the chapter on tumors of the oral cavity. However, the effort to make the book complete without its being too bulky is commendable. In general, this volume may be considered the most valuable text in the English language at the present time on the pathology of the teeth and the adjacent structures.

Books Received

Medical Jurisprudence and Toxicology

By William D. McNally, A.B., M.D., Assistant Professor of Medicine and Lecturer in Toxicology, Rush Medical College, University of Chicago; Attending Toxicologist, Presbyterian Hospital; Attending Staff, St. Joseph's Hospital, Chicago. 386 pages; 23 illustrations. Philadelphia and London: W. B. Saunders Company, 1939. Cloth, $3.75 net.

Life and Letters of Dr. William Beaumont

By Jesse S. Myer, A.B., M.D., Late Associate in Medicine in Washington University, St. Louis. With an introduction by Sir William Osler, Bt., M.D., F.R.S., Late Regius Professor of Medicine in Oxford University, England. 312 pages, illustrated. St. Louis: The C. V. Mosby Company, 1939. Price $5.00.

Then and Now

By Jacob Knickerbocker, A New Yorker. Boston: Bruce Humphries, Inc. 1939. Price $3.00.

Medical Leaves 1939

Editor in Chief, Abraham Levinson; Managing Editor, Hershel Meyer; Associate Editors, Irwin Rubell, Jeanette Hork, Maurice I. Kaplan, Samuel H. Holland; Advisory Council, Joseph C. Beck, Chicago, Chairman, William Feldman, London, England, Harry Friedenwald, Baltimore, Hyman Garber, Montreal, Canada, Isidor W. Held, New York, Joseph Mayer, Tel-Aviv, Palestine, Max Meyerhof, Cairo, Egypt, Nathan Ratnoff, New York, Alexander Sanders, Detroit, H. Seidel, Baltimore, Israel Wechsler, New York, L. Wulman, Warsaw, Poland. Chicago: Medical Leaves, Inc.

The Problem of the Excessively Resorbed Alveolar Ridge with a Suggested Approach to Denture Restoration

Presented by Annie Praed, B.D.S. This paper was submitted as a thesis for the degree of doctor of dental science of the University of Sydney. 84 pages, illustrated. Sydney: Australasian Medical Publishing Company, Ltd.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Reattachment Following Periodontoclasia—In the treatment of periodontoclasia affecting single-rooted teeth, we may well expect a large percentage of replacement of destroyed bone and a reattachment of the soft tissue at the cervix, under proper treatment. This treatment has its foundation in the application of Nature's methods of healing wounds. It is termed "the blood induction method."

All traces of tartar deposits must be removed with as little injury to the cementum as possible. Several medicaments are then used to destroy the foreign tissue on the flesh side of the pocket. No surgical procedures are employed on the bony margins, as this causes the formation of scar bone, Nature's way of closing the case.

All medication is now discontinued and, on visits two or three days apart, the pocket is washed out with normal salt solution, the area around the case is packed with cotton rolls and the pocket is dried. A small explorer with a right angle turn of about 1 mm. is passed to the bottom of the pocket and turned into the flesh, a hemorrhage resulting. The blood is allowed to well up about the tooth and the excess is wiped away. The mouth is kept packed till the blood clots. The patient is dismissed with instructions not to massage the gums or use a toothbrush for two or three days, when he is to return for the blood induction treatment.

The blood clot is Nature's assistant in filling the cavity with bone as after extraction.

Surgical measures and astringents are not used in this method. Caustics or electrocoagulation is used for one or two sittings, followed by mild stimulants. All medication is then discontinued and the case closed with the blood induction method.

The condition is not unlike a dry socket following extraction, and bone regeneration and closure of the pocket is governed by the same laws. With the molar teeth wherein the interlineal space has been reached, there is little hope for repair, as the removal of all deposits is seldom accomplished.

I prefer the therapeutic treatment for the removal of foreign tissue in the pocket first, and the removal of subgingival deposits second, injuring the cementum as little as possible. When the cementum has been removed, it is a much longer process for Nature to build a new layer of cementum.—*W. Clyde Davis, D.D.S., M.D., 814 Security Bldg., Lincoln, Nebr.*

Truisms—The normal human jaw is undoubtedly the best articulator we have. The centric relation is invariably correct. The best root canal filling is the pulpa dentis.—*Calvin William Knowles, M.D., D.D.S., 177 Post St., San Francisco, Calif.*

Synthetic Fillings—To realize more synthetic silicate fillings from stock bottles of

synthetic porcelain powder, the following is suggested: Blend the proper shades in the correct amounts and divide into portions on the glass mixing slab as recommended by the manufacturer. Complete the mix as usual. Instead of discarding the unused and uncontaminated blended silicate powder remaining on the glass slab after incorporating all the necessary powder in the liquid, place it in a clean well-stoppered bottle. After a fair accumulation of this left-over powder, it may be used to fill small class III cavities that do not extend through to the labial surface of the tooth. These fillings display all the features of freshly blended powders, except that they may be slightly different in color from the surrounding tooth structure.—*H. B. Binder, D.D.S., 48 Third Street, Troy, N. Y.*

Oxide of Zinc and Eugenol Paste—To keep oxide of zinc and eugenol (or oil of cloves) from setting, cover it on the slab with a piece of cellophane. The mix can be kept soft and usable for several days at least.—*Alex Weinberg, D.M.D., 170 Westminster Street, Providence, R. I.*

Postoperative Pain—Points to observe that will lessen postoperative pain in nerve block or infiltration are: Use a sharp needle. Inject slowly. Avoid trauma. Know the anatomy of the part injected. Use a sterile, isotonic solution. Last, but not least, inject the solution at blood temperature.—*William F. Taylor, D.D.S., Veterans Administration Facility, Legion, Texas.*

Bitewing Films—I find little use for the large, 2¼ inch bitewing films. With a focal distance of 24 inches, I have, in many cases, so much overlapping of teeth that the pictures are worthless. If only the coronal portions of teeth are to be pictured, I use a standard size film, placing it either vertically or horizontally in the mouth, by putting a small rubber band twice around the packet, pulling one strand across the occlusal surfaces of the teeth and having the teeth brought into occlusion on it. The band may be placed to extend in either direction around the packet and, if desired, nearer to one edge or side than the other. With a 1⅝ inch film and with the target from 16 to 18 inches away from the packet, I get much more satisfactory detail of the interproximal spaces than with the larger films. Teeth are superimposed only where they are malposed.—*A. H. Brown, D. D.S., Republic Bldg., Denver, Colo.*

Examining X-Ray Films—Dental x-ray films must be viewed in the same position in which they were exposed. If a suitable mount can be obtained, each set of films should be securely held in their relative positions in windows of required shapes and sizes. As small or irregular arches make necessary the use of films of different dimensions, it is difficult to get mounts meeting all the requirements as to sizes and arrangement of windows. Mounts may possibly be dispensed with if the following simple rule is followed: With the Eastman film, having a raised dot near one corner, the packet is placed in the mouth with the dot at the lower side or edge when the film is exposed in the horizontal position and with the dot at the upper end or edge when it is exposed in vertical position. Film packets with other identifying marks may be used in the same way. When films are processed and dried, from the concave side of the dot, the distal ends or sides of all left-side films will be at the reader's left, and the distal ends or sides of all right-side films will be at reader's right, as viewed from the lingual aspect. The relative position of any film will thus be instantly recognized.—*A. H. Brown, D.D.S., Republic Bldg., Denver, Colo.*

Tom Thumb Local Anesthesia—Local anesthesia for children 4 or 5 years old is very trying with the usual armamentaria

and methods. It is often necessary to infiltrate for a deciduous tooth at this age. Where a mucobuccal fold infiltration or a mandibular block can be managed, it is the method of choice. However, a few drops deposited in the interdental papilla where the sensory innervation is not good will afford a good start. In case of very short roots, this will be enough; most roots at this age are quite long and well developed. In such cases, one can move the needle from this point down over the alveolus and deposit from 1 to 1.5 cc. This is much better than inserting the needle in the hard gum tissues half way down on the buccal or lingual side, where it will cause pain.

In infiltrating, the bugaboo of the broken needle can be disregarded, as careful handling allows as small a gage as 27, which enters with little resistance.

For the topical anesthetic, phenol judiciously used is quick and efficient. The end of an applicator stick is dipped in phenol and the saturated wooden end is just touched to the spot of puncture. The slough will be so small that it is negligible. This produces a marked white spot about 1 to 2 mm. in diameter and is painless. No cotton should be used on the applicator stick.—*James A. Matthews, D.D.S., Glen Cove, L. I., N. Y.*

Syringe Sterilization—Frequently, carpule syringes are responsible for introducing infection into tissues, since the ease in handling and the time saving factor are conducive to carelessness. Too much is taken for granted now-a-days in the popular effort to "streamline" equipment and speed up work.

Sterilization of the syringe and mounted needle by boiling in water is the best way. It is to be doubted that the immersion of the needle in a cold disinfecting solution commonly called germicidal is effective inside the lumen. Furthermore, these so-called sterilizing solutions do not destroy spores.

To keep the lumen clear of suspended matter in the boiling water, the needle is covered with a piece of cotton roll. The cotton roll is pierced with it and another piece is placed crosswise through the body of the syringe and is held in place with the plunger pushed in.

The carpule content should be one officially recommended by "Accepted Dental Remedies." We trust the manufacturer and supply dealer to insure freshness and sterility. The slightest coloring in a solution, be it only a tint, must pass the scrutiny of the operator. Those not absolutely clear should be discarded.

The rubber sealed carpules should be swabbed with phenol in the same manner as a prepared cavity. The rubber end which is to be punctured by the needle is rubbed with phenol on a small cotton pellet held in college pliers.—*James A. Matthews, D.D.S., Glen Cove, L. I., N. Y.*

Hemorrhage Prevention—Surgical and extraction cases are dismissed only after all signs of bleeding have disappeared. Before leaving, every patient is given full written instructions for control of any possible secondary hemorrhage at home: 1. Do not release pressure on sponge for at least twenty minutes. 2. Do not rinse mouth for at least three hours. 3. Do not drink or eat anything hot for the next twenty-four hours. 4. Do not spit or smoke, and talk little. 5. Use dry cold applications externally five minutes every hour. 6. If seepage persists, in spite of these precautions, do not wash the mouth at all, and place a moistened teabag over the affected area, closing on it firmly for not less than fifteen minutes. Repeat, using a fresh teabag, if necessary. The pressure on the teabag, with the tannic acid in it, will usually stop the bleeding.—*M. L. Rosoff, D.D.S., 369 East 149th Street, New York City.*

INCIDENTS OF PRACTICE

Multiple Impactions

By Horace S. Beemer, D.D.S., Mason City, Iowa.

The patient, a man, aged 21, had complained of dizziness, fainting spells, headaches and underweight for a number of years.

Figure 1 shows two impacted teeth on the lower left side with a dentigerous cyst involving both impacted teeth; Figures 2 and 3, two on the upper left, and Figure 4, two on the upper right. The lower right third molar was partially impacted. (Fig. 5.)

After removal of all of the impacted teeth, the patient gained considerable weight, and recovery was complete.

A roentgenogram of an upper left first bicuspid tooth with three roots is shown in Figure 6. The roentgenogram was taken after the tooth had been extracted. The patient was a man, aged 26.

302 Foresters Building.

Figs. 1-5

Fig. 6

A Simple Method of Treatment of a Fracture of the Maxillae

By Joseph Ed Ruby,* D.M.D., Bridgeport, Conn.

I am reporting this case because of the simple and unique method of treatment.

History.—A negro, aged 35, was in an automobile accident, and roentgenographic examination of the bones of the face demonstrated multiple fractures; i.e., complete fracture through the right maxillary bone extending into the right maxillary sinus and entirely through the inferior orbital ridge; complete oblique fracture of the right zygomatic bone near its junction with the maxillary bone, and complete fracture through the left maxillary bone in the region of the infra-orbital ridge, most of the deformity being on the right side, with separation of the maxillary and zygomatic bones. The maxillae could be moved freely as a unit.

Treatment.—A plaster headcap was made,

*Assistant Odontologist, Bridgeport Hospital.

such as Curtis and Ivy describe in their recent book, with 14 gage nickel-silver wire embedded on each side of the plaster cap 6 inches in length. An arch wire was interlaced to the teeth as usual, the teeth having been soldered to lingual bars extending extra-orally on each side to correspond with wires already embedded in the plaster cap above.

Fig. 1.—Appearance of patient with appliance in position.

In these parallel bars were inserted small steel blocks which had been machined for 14-gage nickel-silver wire or bars to slip through horizontally as well as vertically and threaded for set screws to hold the bars rigidly. (Fig. 1.)

Comment.—Simplicity being the watchword, this method of fixation has the advantage over the use of elastics and ligature wire. It prevents overriding of the fractured fragments, preserves the normal facial length and makes any desired position possible without breaking the whole appliance down if necessary. These steel bars, once made, can be used time and time again. Any machinist can make them. (Fig. 2.)

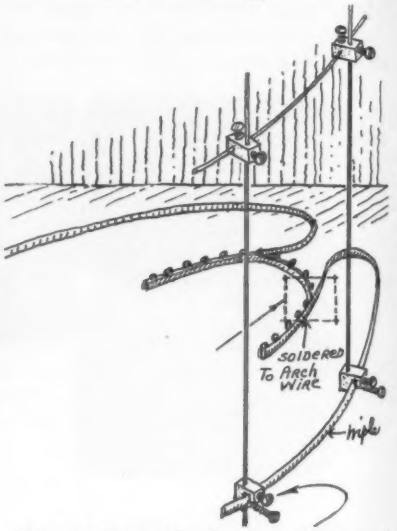


Fig. 2.—Schematic drawing showing arch with extra-oral bars, steel bars and nickel-silver wires in position.

An Open Letter to Dental Research Workers

By L. M. Fleisch, D.D.S., Topeka, Kan.

Dentistry's opportunities for valuable contributions to the field of preventive medicine will increase in direct proportion to the results of the effort to solve the problem of the etiology of dental disease. The last decade has brought forth a more thorough and complete understanding of the complexity of this problem, together with an insight into the principal etiologic factors. Monumental research by Boyd and Drain, Bunting, Gies, Hanke, Howe, Marshall, Mellanby, Price and others has given us a sound foundation upon which to build our premise. These workers have each in their own field contributed immeasurably to the known facts as related to the etiology of dental disease, and they have in most instances succeeded in reducing its incidence in representative numbers of cases of disease.

It is true that they have controlled dental caries. It is true they have seen carious tooth structure recalcified. It is true they have seen soft spongy gums become hard, pink and disease resistant, but we are not satisfied because they cannot tell us exactly and precisely what the exciting and destructive agents are and how they operate. They have studied the saliva, the pH, buffer power and mineral content, which do not furnish the evidence they seek. They have studied the blood and urine and do not get help in our problem. They have studied the mouth flora in dental caries and are unable to convince us that *L. acidophilus* is the

destructive agent. They have studied the mouth flora in periodontal lesions, and we cannot decide whether the spirochete and fusiform bacillus or the deadly streptococcus is the destructive agent.

In spite of their efforts and because of our eternal vacillation, people in this land of ours are losing their teeth at an alarming rate; which is indeed a calamity. But an even more alarming fact is that many of these people not only lose their teeth: they lose their health too, an even greater catastrophe. Many of our most brilliant observers attribute the loss of both teeth and health to a disturbance in metabolism from improper nutrition. They tell us that mouths of people immune to or free from dental caries will not sustain bacterial life that destroys teeth, call it *L. acidophilus* or what you will. Topping and Fraser[1] report they have been unable to sustain in the mouths of healthy monkeys bacterial life that destroys the periodontal tissues of malnourished monkeys.

Have we, in our studies, overlooked unknowingly the fundamental law of nature that all life must have suitable environment? Our knowledge of bacteriology will tell us that we must have suitable media for the cultivation of different organisms. Our knowledge of physiology and physiologic chemistry tells us that the amount and character of the saliva secreted vary, depending among other conditions on the character of the food ingested. We know increased ingestion of carbohydrate, particularly refined sugars and cereals, sometimes described as being rich in food energy, will increase the incidence of dental caries in many individuals. Likewise, this same factor will increase the incidence of periodontal lesions in other individuals.

The phrase "rich in food energy" has been thoroughly fixed in the minds of the public by advertisers of refined food products, the result being that they regard these products as necessary for the production of energy. The conception that calories or fuel value of foodstuffs is governed entirely by carbohydrate, protein and fat content is in the process of revision, and herein may lie our clue to the answer we seek. The so-called pure energy foods consist principally of refined carbohydrates, proteins and fats from which has been taken crude fiber, vitamin B complex and appreciable quantities of calcium, phosphorus, iron and sometimes copper. The so-called natural energy foods contain all these substances. Can it be that Nature needs all these materials to create energy without robbing body tissues and fluids of them? Spies[2] has reported that within four hours after the injection of 50 mg. of synthetic vitamin B_6 in a sterile physiologic solution of sodium chloride into persons who had been treated successfully for pellagra, but who remained on their deficient diets, dramatic relief was evident from such symptoms as extreme nervousness, insomnia, irritability, abdominal pain, weakness and difficulty in walking. One of these persons, who had been unable to walk more than a few steps, walked 2 miles within twenty-four hours after the injection of 50 mg. of vitamin B_6. This may seem at first glance not to have the slightest relation to our problem. However, let us remember that a definite relationship has been shown between refined foods and dental disease.

Nature, in converting fuel values of foodstuffs into energy, needs more than pure carbohydrates, proteins and fats. The saliva reflects the character of the food ingested and it is possible that it might reflect a vitamin deficiency. Analytic methods would need to be very meticulous and critical, for we would expect to find a very small amount of the vitamin material in normal saliva. We will define normal saliva as saliva secreted by an individual who is physically perfect as far as can be determined, who is free from dental caries and has normal healthy gingival tissue and whose nutritional needs are satisfied. We should examine the blood from the same individual to arrive at a normal for blood. For what vitamins shall we look? In the case of dental caries, it would seem logical to suspect a vitamin B complex deficiency. Bacteriologists can confirm our findings or perhaps tell us what vitamins to study by adding very small amounts of these substances to their culture media in an effort to inhibit the growth of *L. acidophilus,* which is accepted in some quarters as an index to the activity of dental caries. The combined effort of the physiologist, the physiologic chemist and the bacteriologist will exhaust all possible clues.

In view of the findings of Topping and

Fraser, the application of this theory to the problem of the etiology of periodontal lesions would seem very much more complicated. However, if there is the remotest possibility of success, we must not fail to exhaust all of its possibilities. Our responsibilities to our fellow men make it imperative that we find the cause of dental disease, and make to all men this simple suggestion: "Do not lose your teeth from disease even though they can be replaced, for you may lose your health or even your life in the process."

BIBLIOGRAPHY

1. Topping and Fraser: Mouth Lesions Associated with Dietary Deficiencies. *Pub. Health Rep.*, 54:416, March 17, 1939.

2. Spies, J. D.; Bean, W. B., and Ashe, W. F.: Note on Use of Vitamin B_6 in Human Nutrition. *J.A.M.A.*, 112:2414, June 10, 1939.

504 Central Building.

DEATHS

Anderson, R. E., Long Beach, Calif.; University of Nebraska, College of Dentistry, 1916; died May 7; aged 45.

Cheeseman, Frank E., Chicago, Ill.; Chicago College of Dental Surgery, 1899; died June 20; aged 73.

Clark, Henry T., Longmont, Colo.; Washington University School of Dentistry, 1897; died recently; aged 67.

Donaldson, James R., Denver, Colo.; School of Dentistry University of Denver, 1891; died April 4; aged 72.

Ewers, Joseph G., Denver, Colo.; School of Dentistry University of Denver, 1925; died recently; aged 43.

Franz, Hugo, Chicago, Ill.; Chicago College of Dental Surgery, 1893; died April 28; aged 70.

Haas, Emil F., Kansas City, Mo.; Kansas City Dental College, 1911; died recently; aged 60.

Hartung, George J., Denver, Colo.; New York University College of Dentistry, 1876; died recently; aged 85.

Huston, C. R., Fayette City, Pa.; University of Pittsburgh, School of Dentistry, 1919; died recently.

Jendrzeski, Leo J., Carnegie, Pa.; University of Pittsburgh, School of Dentistry, 1914; died recently.

Kester, Palemon John, Oak Park, Ill.; University of Michigan School of Dentistry, 1877; died recently.

Latey, William H., Omaha, Nebr.; died February 26; aged 77.

MacHugh, John, Philadelphia, Pa.; Philadelphia College of Dental Surgery, 1891; died May 5; aged 73.

Matten, Harry, Wilkes-Barre, Pa.; University of Pittsburgh, 1910; died recently.

Murphy, Jerry W., Green Bay, Wis.; Marquette University School of Dentistry, 1919; died May 5.

Niswonger, M. E., Dayton, Ohio; College of Dentistry, Ohio State University, 1914; died May 8; aged 47.

Nixon, Greenbury Croford, Youngstown, Ohio; Philadelphia Dental College, 1882; died January 18; aged 85.

Reidy, Matthew Joseph, Mallard, Iowa; Chicago College of Dental Surgery, 1901; died recently; aged 65.

Reynolds, Clayton J., Pittsburgh, Pa.; Pennsylvania College of Dental Surgery, 1878; died recently.

Schultz, Emory J., Hollywood, Calif.; State University of Iowa College of Dentistry, 1906; died May 6; aged 57.

Sossaman, Oliver H., Medford, Wis.; State University of Iowa College of Dentistry, 1892; died April 28; aged 73.

Specht, Rube W., Garner, Iowa; State University of Iowa College of Dentistry, 1923; died April 20; aged 39.

Straube, L. D., Louisville, Colo.; Washington University School of Dentistry, 1927; died recently.

Van Horne, Mark D., Los Angeles, Calif., formerly of Bunker Hill, Ill.; Western Dental College, 1892; died May 10.

Wallace, Thomas Bernard S., Chicago, Ill.; Northwestern University Dental School, 1898; died April 19; aged 69.

Weaver, Charles H., Jr., Sedalia, Mo.; Kansas City-Western Dental College, 1936; died April 18; aged 27.

Wilson, George H., Union, Mich., formerly of Chicago, Ill.; University of Illinois College of Dentistry, 1904; died June 19; aged 74.

Golden Gate Dental Congress

JOHN E. GURLEY, *President* FRED T. WEST, *Secretary*

SPONSORED BY

The California State Dental Association
Howard B. Kirtland, President

and the

Southern California State Dental Association
E. Stanley Rice, President

SAN FRANCISCO

September 25-26-27, 1939

FAIRMONT HOTEL HOTEL MARK HOPKINS

Golden Gate International Exposition. Treasure Island. Seeming to float on the waters of San Francisco Bay, the island rests midway between San Francisco and the cities of the East Bay region. The architecture of the Golden Gate International Exposition follows that of an ancient walled city, its profile broken by the 400-foot Tower of the Sun. This photograph was taken from the San Francisco shore, nearly 3 miles west of Treasure Island. The intervening water forms the main ship channel, through which the world's largest commercial and naval vessels pass with ease.

GOLDEN GATE DENTAL CONGRESS

SAN FRANCISCO, host of the Pacific Coast in 1939, invites all members of organized dentistry to join with her in celebrating the Golden Gate Dental Congress to be held here September 25, 26, 27, 1939. The Golden Gate Dental Congress is sponsored by the California State Dental Association and the Southern California State Dental Association and will be assembled jointly in San Francisco's world-renowned neighboring hotels, the Fairmont and the Mark Hopkins. These hotels, situated atop Nob Hill, overlook beautiful San Francisco Bay, affording a magnificent view of Treasure Island, home of the great Golden Gate International Exposition.

In developing this Congress, it has been our general plan to make this meeting in reality a dental educational meeting on the theme of "Past, Present and Future of Dentistry." In carrying out this thought, in the furtherance of a practical application of the theme, the Program Committee will place on display essayists and clinicians who will fill the minds of "eager men after the truth," with dental knowledge and procedures which will be of inestimable value in the days and years to come.

Golden Gate International Exposition. Across one of the Lakes of the Nations, seen by moonlight (with the moon actually rising above the colonnade) and with the aid of artificial lighting, is the California State Building, at left, separated from the San Francisco Building, at right, by the California Colonnade.

The program of the Golden Gate Dental Congress is rapidly taking form. Various nationally known men will make an exceedingly strong framework around which is being built much quality material in producing a program structure of dental education highly valuable to the attending profession.

The facilities afforded by the two hotels for the successful mechanical functioning of our meeting are perfect. Large, spacious, well-ventilated rooms for general assemblies capable of comfortably seating capacity crowds; smaller rooms for section meetings, where those most vitally interested can closely gather without fear of distraction from nearby assemblies; large halls for those always interesting scientific exhibits and for the dental trade exhibits; rooms for group

meetings and round-table discussions all are available; in fact, everything for the proper functioning of our Congress is promised.

Plan now to spend at least a week in San Francisco during the time of the Congress. Many interesting features are promised in the way of entertainment, including golf and trap-shooting tournaments, a dinner dance and special luncheon features. For the women, an afternoon social function, including luncheon and a gala fashion show, is the present plan.

Do not forget that the month of September offers the best of sunny weather and ideal climate for visiting the Golden Gate International Exposition on Treasure Island. Truly, September is the perfect vacation month, and this year, especially, with the added features of our own Golden Gate Dental Congress, the San Francisco Bay region is a place you must visit especially during September 25, 26, 27, 1939. Please do not disappoint yourselves or us. We shall be looking for you.

Golden Gate International Exposition. Fronting on Temple Compound are the impressive Towers of the East, one of which is here shown. The lighting fixtures, especially designed for the exposition, are singularly fitting in this scene. At the left is the belfry section of the 400-foot Tower of the Sun. Overhead, a blimp drones lazily over the Treasure Island picture-book city.

LLOYD E. LINEHAN,
Chairman of Publicity,
135 Stockton St.,
San Francisco, Calif.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN CONGRESS OF PHYSICAL THERAPY, New York City, September 5-8.

AMERICAN DENTAL SOCIETY OF EUROPE, Lausanne, Switzerland, August 7-9.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York City, fourth Monday in March and October.

CONGRESS OF AUSTRALIAN DENTAL ASSOCIATION, Melbourne, August 21-26.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

EASTERN ONTARIO DENTAL ASSOCIATION, Ottawa, Canada, October 16-17.

GREAT LAKES ASSOCIATION OF ORTHODONTISTS, Dearborn, Mich., November 6-7.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, Montreal, Canada, September 27-29.

NATIONAL DENTAL ASSOCIATION, New York City, August 14-18.

NEW ENGLAND DENTAL SOCIETY, Boston, Mass., October 4-5.

STATE SOCIETIES

September

California State, at San Francisco

October

Southern California, at Los Angeles (15-20)

Hawaii, at Wailuku

November

Connecticut, at New Haven (15)

Ohio, at Columbus

Puerto Rico, at Caguas City

February (1940)

Minnesota, at St. Paul (27-29)

April (1940)

Louisiana, at Monroe (18-20)

Texas, at Dallas (9-11)

May (1940)

Indiana, at Indianapolis (20-22)

June (1940)

Connecticut, at New London (5-7)

STATE BOARDS OF DENTAL EXAMINERS

Illinois, in Chicago, November 7-10. Homer J. Bird, Springfield, Superintendent of Registration.

Iowa, at Iowa City, December 11-15, Hardy F. Pool, Mason City, Secretary.

New Jersey, December 11-16. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY IN NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations commencing December 11 and continuing for five days thereafter. A copy of the requirements and rules, instruction sheet and preliminary application blank will be sent on request to the secretary. Candidates must file the preliminary application blank, together with the examination fee of $25 before September 1 for the December examinations and on or before March 15 for the June examinations.

WALTER A. WILSON, *Secretary,*
148 West State St.,
Trenton.

IOWA STATE BOARD OF DENTAL EXAMINERS

THE next examination of applicants to practice dentistry in Iowa will be held at the University of Iowa, College of Dentistry, Iowa City, December 11-15. All applications, properly executed, with college diploma and fee, must be filed with Mr. H. W. Grefe, director, Division of Licensure and Registration, Iowa State Department of Health, State House, Des Moines, at least fifteen days

prior to the first day of examination.

HARDY F. POOL, *Secretary,*
Mason City.

CONNECTICUT STATE DENTAL ASSOCIATION

THE Mid-Season Meeting of the Connecticut State Dental Association will be held in New Haven at the Yale Medical School, November 15. The annual meeting will be held at the Hotel Griswold, New London, June 5-7, 1940. The president for the ensuing year is William J. Murray, 302 State St., New London.

C. W. VIVIAN, *Secretary,*
New Britain.

NEW ENGLAND DENTAL SOCIETY

THE seventy-sixth annual meeting of the New England Dental Society will be held at the Forsyth Dental Infirmary, Boston, Mass., October 4-5.

PHILLIP J. JONES, *Secretary,*
750 Main St.,
Hartford, Conn.

UNIVERSITY OF BUFFALO DENTAL ALUMNI

THE thirty-ninth annual meeting of the University of Buffalo Dental Alumni Association will be held at the Statler Hotel, Buffalo, October 11-13.

TRACY M. BISSELL, *Chairman,*
Publicity Committee,
3311 Bailey Ave.,
Buffalo, N. Y.

MONTREAL DENTAL CLUB FIFTEENTH ANNUAL FALL CLINIC

THE program of the Fifteenth Annual Fall Clinic to be held under the auspices of the Montreal Dental Club September 27-29 is rapidly taking shape. Clarence O. Simpson, St. Louis, Mo., will present a paper and conduct a registered clinic group on radiography. Don E. Woodard, Kansas City, Mo., and Carlisle C. Bastian, New York City, will present similar programs on minor oral surgery and inlay bridgework, and porcelain jackets, respectively. G. R. Lundquist, Chicago, Ill., W. V. McGilvra, Worcester, Mass., Lowrie T. Porter, New York City, and Gaylord J. James, Cleveland, Ohio, will present illustrated papers on various dental subjects.

The table clinics will be presented entirely by members of the Ottawa Dental Society and will be one of the features of the meeting.

A cordial invitation is extended to all dentists to attend the three day meeting. A preliminary program, which will be published September 1, will be sent on request.

F. A. EDWARD, *Chairman of Publicity,*
Medical Arts Building,
Montreal, Quebec.

AMERICAN CONGRESS OF PHYSICAL THERAPY

THE eighteenth annual scientific and clinical session of the American Congress of Physical Therapy will be held September 5-8 at the Hotel Pennsylvania, New York City. Before these sessions, the Congress will conduct an intensive instruction seminar in physical therapy for physicians and technicians, August 30-September 2.

A. R. HOLLENDER, *Executive Director,*
30 N. Michigan Ave.,
Chicago, Ill.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING MAY AND JUNE 1939

May 2

Re. 21,069, to DOMENICK PELLEGRINI. Denture cleaning device.

No. 2,156,757, to CORNELL JOEL GROSSMAN. Dental casting alloy.

May 9

No. 2,157,503, to ARTHUR E. SMITH. Ampoule syringe.

May 16

No. 2,158,593, to WILLIAM SCRIMGEOUR. Hypodermic syringe.

No. 2,158,692, to SAMUEL DUBERSTEIN and NICHOLAS LAWNER. Sterilizer.

No. 2,158,698, to GEORGE HETTINGER. Sterilizer.

No. 2,158,738, to ROLLYN H. BAKER. Motor operated toothbrush.

No. D-114,821, to EDWARD L. MONNOT. Design for a dental unit.

No. D-114,822, to EDWARD L. MONNOT. Design for a standard for a dental unit or the like.

No. D-114,849, to EDWARD L. MONNOT. Design for a dental unit.

May 23

No. 2,159,295, to CHARLES HENRY SEIFERT. Toothbrush.

No. 2,159,437, to WILLIAM D. KIRBY. Dental flask.

No. 2,159,914, to RALPH L. TWEEDALE. Toothbrush.

May 30

No. 2,160,149, to SAMUEL JELLINEK. Dental plate cleanser.

No. 2,160,731, to ARTHUR HAEBERLIN. Dental pencil.

June 6

No. 2,160,835, to ROBERT B. DAVIDS. Combined toothbrush and masseur.

No. 2,160,836, to ROBERT B. DAVIDS. Combined toothbrush and masseur.

No. 2,161,151, to HYMAN FREEDMAN. Saliva ejector.

No. 2,161,169, to ALBERT W. JEFFERIS. Dentiphone.

No. 2,161,349, to GILBERT E. HADDEN. Toothbrush.

No. D-115,132, to MATTHEW W. SCHNEIDER. Design for a dental furnace or similar article.

No. D-115,133, to BESSIE L. SHORT. Design for a combined toothbrush and powder holder.

June 13

No. 2,161,998, to EDWARD L. CHOTT. Mortar and pestle.

No. 2,162,178, to MARTIN MARASCO and EDWIN ATKINS MERRITT. X-ray shielding compound.

No. 2,162,204, to GEORGE S. WEITH. Denture.

No. 2,162,242, to WILLIAM BRANOWER. Resuscitation apparatus.

No. 2,162,252, to CORNELL JOEL GROSSMAN. Dental casting alloy.

No. 2,162,253, to CORNELL JOEL GROSSMAN. Dental casting alloy.

No. 2,162,283, to BENJAMIN OSHMAN and JOSEPH OSHMAN. Toothbrush retainer.

No. 2,162,444, to DAVID W. PHILLIPS. Dental pin.

No. 2,162,447, to PHLILIP H. SEIBEL. Dentifrice containing and dispensing toothbrush.

No. D-115,231, to EDWARD B. GRAVES and ROBERT J. STAVA. Design for a control panel board and housing for dental x-ray machines.

June 20

No. 2,163,014, to WILLIAM A. VOIGT. Method of making a denture.

No. 2,163,211, to WILLIAM G. WOLF. Toothbrush.

No. 2,163,240, to CONRAD HOFMANN. Device for filling pneumatic injection syringes.

No. 2,163,500, to EDWIN E. SHEPARD. Dental floss adjuster.

No. D-115,291, to THOMAS M. MCDONALD. Design for an x-ray unit.

No. D-115,326, to EDWARD L. CHOTT. Design for a dental tool.

June 27

No. 2,163,837, to HAROLD RUSH HALL and GEORGE WASHINGTON CONNOR. Dentists' gold-recovering drain attachment.

No. 2,163,862, to JACK WING. Holder or container for dentures and other articles.

No. 2,164,144, to RALPH A. PITTMAN and JOSEPH A. GARDNER. Dental articulator.

No. 2,164,219, to JAMES J. MCGERRY. Dental massage appliance.